Mining

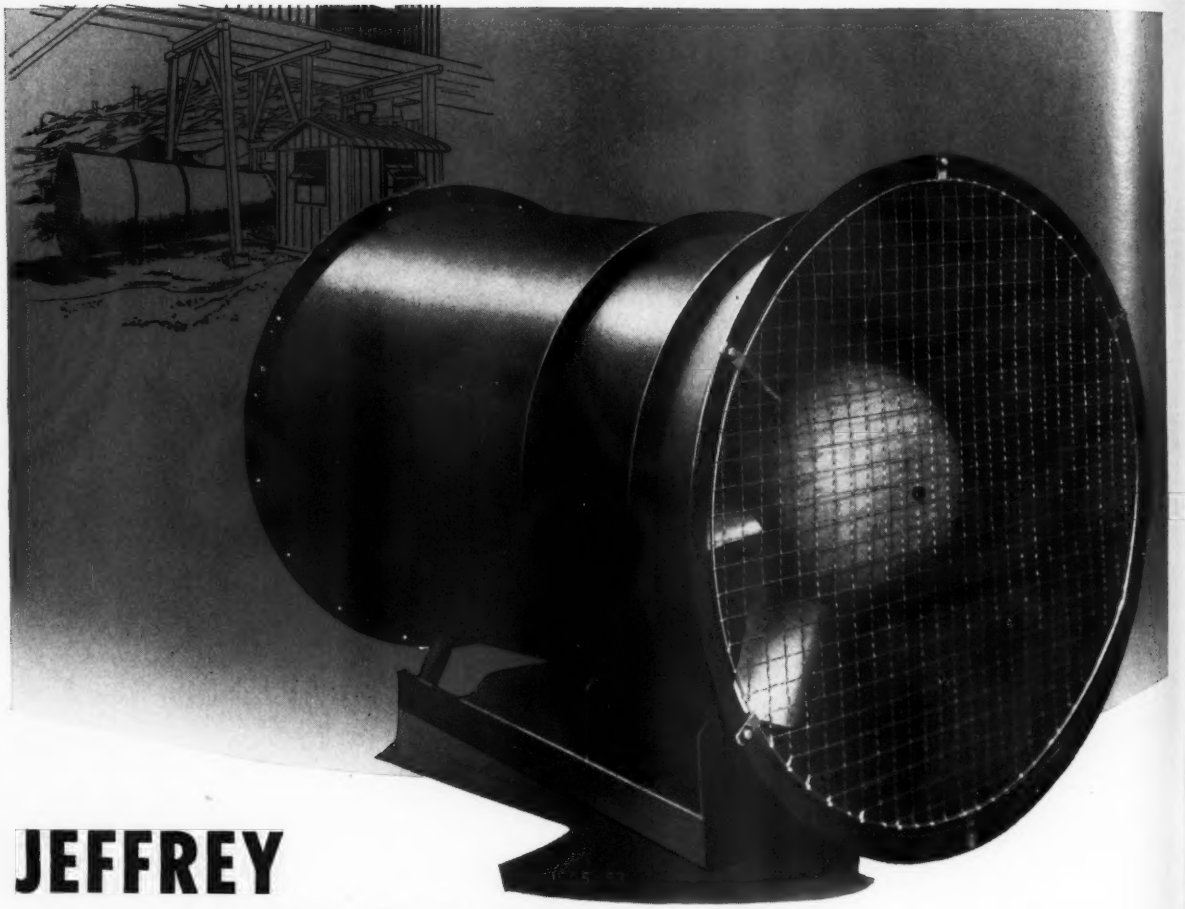
AMC

★

OCTOBER 1954

★

CONGRESS JOURNAL



JEFFREY
new 6F AERODYNE FANS
combine economy and efficiency

For light and medium-duty mine ventilation up to 5" W.G. pressure, Jeffrey now offers the new, economical 6F Series AERODYNE Fan.

The 6F Series combines low cost with high efficiency. Many of the fine engineering features of the AERODYNE Series first introduced by Jeffrey in 1936 are incorporated in this new self-contained 6F Fan.

THESE FEATURES IMPROVE OPERATION:

- Universally adjustable blades made of cast-aluminum alloy and mounted on a solid aluminum alloy hub.
- Air reversal possible by reversing blade pitch or direction of rotation.
- Flange-mounted anti-friction bearings.
- Various lengths of expansion discharge for different duties.
- Overhung drive and fan wheel for belt drive up to 125 HP . . . can be direct-connected for higher HP ratings.

Learn more about the 6F Series — the fan with AERODYNE quality in the low cost field. Write to the Jeffrey Ventilation Division for details.

THE JEFFREY MANUFACTURING CO.

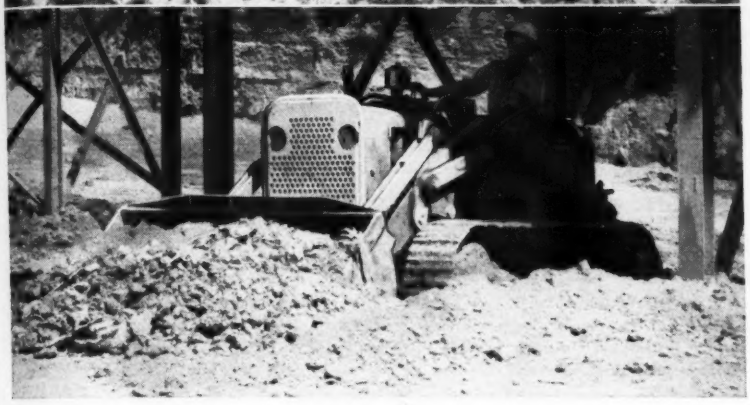
ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA.

IF IT'S MINED, PROCESSED OR MOVED
. . .IT'S A JOB FOR JEFFREY!



Allis-Chalmers Tractor Shovels

bring new flexibility to mining operations

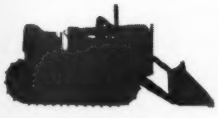
ALLIS-CHALMERS offers a complete line of time-tested Tractor Shovels to mechanize mining operations in a new, better way . . . four sizes with standard bucket capacities from one to four cubic yards. These units bring year-round, time- and money-saving advantages on a wide variety of the toughest mine jobs . . . loading, stockpiling ore; handling sand, gravel and other bulk materials; cleaning up around hoppers, conveyors, shovels; building access roads; maintaining tailing dumps; digging, lifting, dozing and grading on many other mine jobs.

Important advantages include: more track on the ground for better stability, traction and flotation . . . truck wheels, support rollers and idlers that require lubrication only once every 1,000 hours . . . all-steel welded construction to withstand the shock and strain of tractor-shovel work . . . simplified hydraulic system for shovel control . . . lugability that assures unfaltering performance . . . minimum service requirements.

In addition, buckets for light materials, rock buckets, lift forks, bulldozer blades and other quick-change attachments are also available.

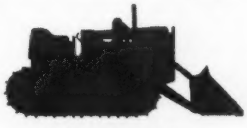
The Allis-Chalmers dealer in your area will gladly discuss earth-moving and Tractor Shovel applications with you.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



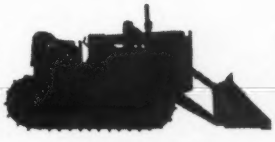
HD-5G

40 drawbar hp
Weight — 16,200 lb
Standard Bucket Capacity
— 1 cu yd
Dumping Height
— 9 ft, ½ in



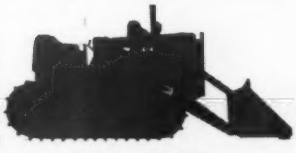
HD-9G

72 drawbar hp
Weight — 29,900 lb
Standard Bucket Capacity
— 2 cu yd
Dumping Height
— 11 ft, 4 in



HD-15G

109 drawbar hp
Weight — 47,580 lb
Standard Bucket Capacity
— 3 cu yd
Dumping Height
— 11 ft, 7 in
With Torque Converter Drive
135 net engine hp
Weight — 48,030 lb



HD-20G

175 net engine hp
Torque Converter Drive
Weight — 63,325 lb
Standard Bucket Capacity
— 4 cu yd
Dumping Height
— 12 ft, 10 in

LOOK what they're saying about

ANACONDA SECURITYFLEX* SHOVEL CABLE

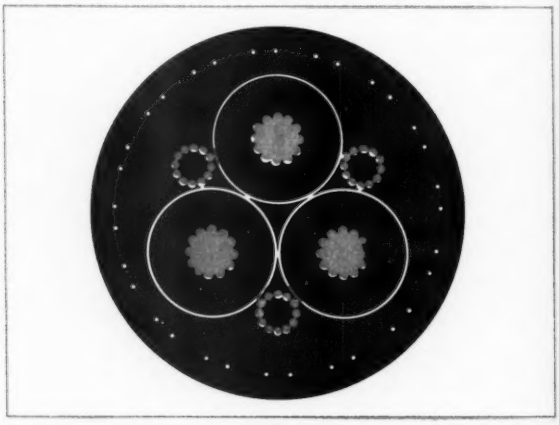
GENERAL MANAGER:
"This cable saves us money . . . there are far fewer breaks . . . and far fewer shorts from ground wires."

MINE ENGINEER:
"No matter how we run it over rocks, it holds up well. It must be the jacket. It wears like iron."

MINE FOREMAN:
"Securityflex sure is flexible . . . mighty easy to handle, too . . . the toughest cable we've ever used."

MINE SUPERINTENDENT:
"Our men can splice Securityflex easily and in less time. That saves us on down-time."

These are the things Anaconda salesmen hear daily about Securityflex Type SH-D Shovel Cable. Why not see *your* Anaconda Sales Office or Distributor for full information about this cable? *Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.* *Trade Mark 54338



AND THE REASON USERS CAN SAY THIS IS BECAUSE:

- **New BUTYL INSULATION provides better resistance to heat, moisture and damage by compression**
- **New NEOPRENE JACKET is tougher and more abrasion resistant**
- **RUBBER CORES cushion the ground wires . . . help prevent broken wires**
- **New COPPER-COTTON SHIELD is easier to splice**

the right cable for the job

ANACONDA®

WIRE AND CABLE

"TIMKEN® bearings on our 300 Sanford-Day mine cars have gone 21 yrs. without a failure"

. . . says Clover Fork Coal Company

TWENTY-ONE years of the pounding a mine car has to take and not one bearing failure! That's the impressive record Timken® tapered roller bearings have racked up for the Clover Fork Coal Co., Harlan County, Kentucky, on the axles of its 300 Sanford-Day mine cars. This record is all the more incredible because the going is even rougher than usual for these mine cars—they have to be lowered down a 900 foot incline to reach the tipple.

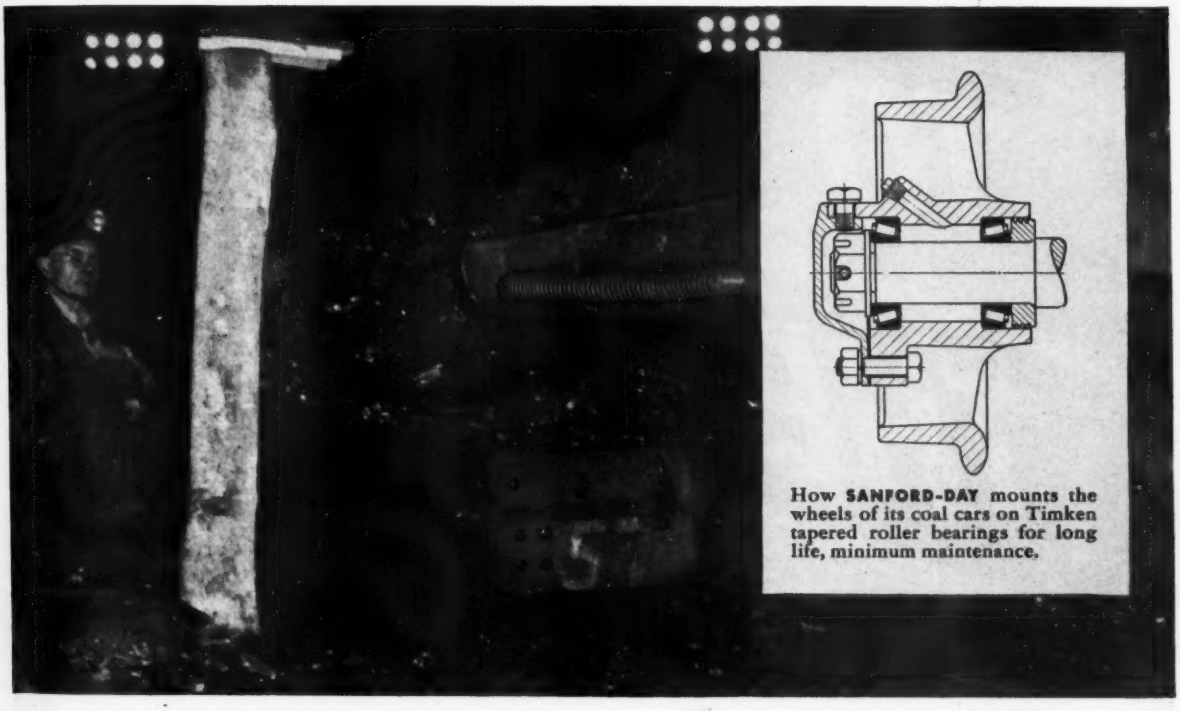
What's the secret of Timken bearings' long life and trouble-free performance?

Greater resistance to shocks is one answer. Special steel made in our own mills is case-hardened to provide a wear-resistant surface over a tough, shock-resistant core. Timken bearings take the abuse a mine car regularly gets with minimum time-out for maintenance and repair.

Another reason for Timken bearings' long life is their true rolling motion and smooth surface finish. There's practically no friction. It's easier to start cars. More cars can be hauled with no increase in power. And full line contact between rollers and races gives Timken bearings extra capacity to handle the heaviest loads. Their tapered design enables them to take radial and thrust loads in any combination.

Timken bearings require less lubrication. Closures are more effective because Timken bearings keep hubs and axles concentric. Lubricant stays in—dirt and moisture stay out. So for longer life, less friction, minimum maintenance, always specify Timken bearings on the mine cars you buy. Look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **SANFORD-DAY** mounts the wheels of its coal cars on Timken tapered roller bearings for long life, minimum maintenance.

IT'S TIMKEN BEARINGS FOR VALUE!

To get the best value in bearings you may find this simple formula helpful:

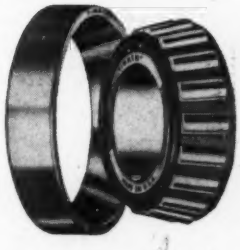
$$Value = \frac{quality + service + public\ acceptance}{price}$$

Obviously a big advantage *above* the line gives you more value than a small one *below*. No other bearing can match the uniform high quality, engineering and field service and overwhelming public acceptance you get with Timken bearings.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION →✳←

Best way TO STAY IN THE BLACK!

In these days of high operating costs it's vital to mechanize. An acf Mine Car Haulage System is an important part of this mechanization. Here's why:

acf Mine Cars are designed and built to give the maximum in economical operation. Example: their drop-bottom action permits the unloading of *a ton of coal a second!* Breakdowns can't cause costly delays . . . an injured car can be quickly shunted to a siding, most often to be repaired *by your own men!* You get money-making 'two-way haulage'—men and supplies go into the mine, coal comes out.

Call your nearby acf Representative for the facts. Let him help you *streamline* your mine operations into the big money! acf Industries, Incorporated, New York • Chicago • St. Louis • Cleveland Philadelphia • Huntington, W. Va. • San Francisco Washington • Berwick, Pa.

acf **MINE CARS** *for Constant Haulage*

OCTOBER, 1954

VOLUME 40 • NUMBER 10

Mining

CONGRESS JOURNAL

CONTENTS

FRONT COVER: Power shovel loads waste during winter at the King mine of Oliver Iron Mining Co. at Coleraine, Minn., on the Mesabi Range.

EDITORIALS 25

STRIP LAND RECLAMATION AT LITTLE SISTER 26
By GEORGE W. SALL

EXPERIENCE WITH LARGE ROTARY DRILLS 29
By LEWIS A. PERSONS

VENTILATION AND ROOF CONTROL WITH CONTINUOUS MINING MACHINES 33
By JOHN A. STACHURA

OUTLOOK FOR THE NON-FERROUS METALS 36
By SIMON D. STRAUSS

MAINTENANCE OF ELECTRICAL CAP LAMPS 39

STRUCTURAL CONTROLS OF URANIUM DEPOSITS 49
By E. V. REINHARDT

MAN TRIPS AND SUPPLY HAULING 53
By H. W. MEADOR, R. W. STOREY and D. A. ZEGEER

THE SHEET-MICA INDUSTRY 59
By W. F. DIETRICH and W. H. WAGGAMAN

WHEELS OF GOVERNMENT 64

PERSONALS 66

NEWS AND VIEWS 68

MANUFACTURERS FORUM 83

Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

Copyright 1954, by

THE AMERICAN MINING CONGRESS
RING BLDG., WASHINGTON 6, D. C.

HOWARD I. YOUNG
President
WORTHEN BRADLEY
Vice-President
ANDREW FLETCHER
Vice-President
RAYMOND E. SALVATI
Vice-President
JULIAN D. CONOVER
Exec. Vice-President and Secretary

Member
Audit Bureau of Circulation

Editorial Director
JULIAN D. CONOVER

Editor
JOHN C. FOX

Assistant Editor
GEORGE W. SALL

Associate Editors
G. B. SOUTHWARD
H. L. MOFFETT
P. D. MCMURRER
W. I. POWELL

•

Production
B. C. WILKERSON
J. J. WARD

•

Advertising
P. D. McMURRER
Manager

FRANK W. MORAN
Chicago

RALPH F. DUYSTERS
New York City

RALPH W. HARKER
Los Angeles and San Francisco

•

Circulation
M. D. TAYLOR

Published Monthly. Yearly subscriptions, United States, Canada, Central and South America, $3.00. Foreign $5.00. Single copies, $0.30. February Annual Review Issue, $1.25. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.

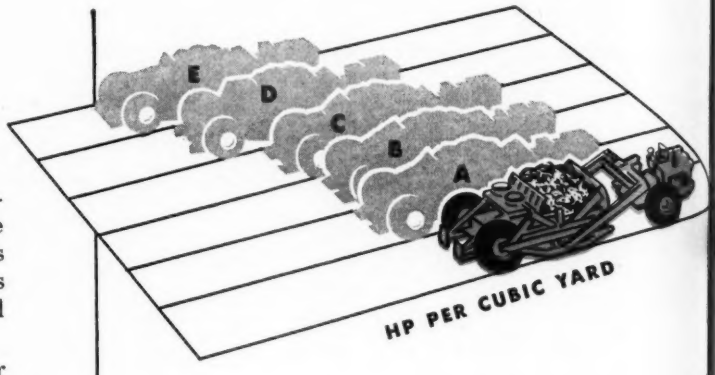
Indexed regularly by Engineering Index, Inc.

COMPARE POWER, BALANCE AND TRACTION AND

Why Allis-Chalmers Motor Scrapers

Examine the Allis-Chalmers TS-200 or TS-300 Motor Scraper point by point, feature by feature. Then let your Allis-Chalmers dealer demonstrate what these features mean to you in terms of bonus yardage and dependable performance.

See how fast Allis-Chalmers Motor Scrapers accelerate to "get the jump" on normal production from the moment they leave the pusher. See how safely they high-ball with a full load . . . how fast and steady they pull through the deep fill and return, up grade, to start a new cycle. Compare these Motor Scrapers on the basis of work done per dollar of investment. We think you'll agree an Allis-Chalmers Motor Scraper is your *number one* earth-moving value.



ACCELERATES FAST

The TS-200 develops 17.6 hp per cu yd struck capacity . . . the TS-300 develops 20—the highest ratios in their respective classes. With more power to move the payload, these machines get away from the pusher *fast* and maintain high average speeds throughout the entire cycle.

PERFORMANCE MAKES DOLLARS WHEN DESIGN

D YOU'LL SEE

s *Out-produce*

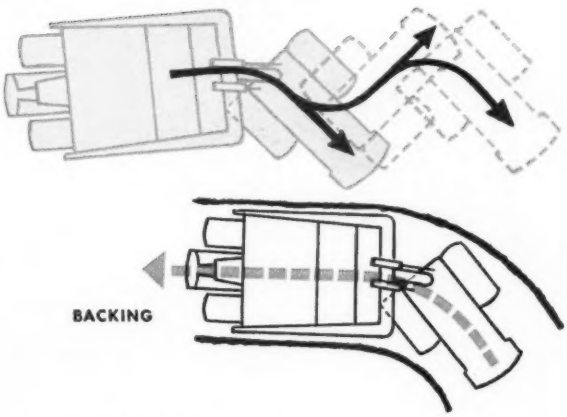
WEIGHT DISTRIBUTION LOADED

50 PERCENT 50 PERCENT

HIGHBALLS WITH THE PAYLOAD SAFELY

Loaded, the Allis-Chalmers Motor Scraper has equal weight on all four tires. This ideal weight distribution, together with low center of gravity, direct hydraulic steering which eliminates jackknifing, and big air brakes on all four wheels, allows the Allis-Chalmers Motor Scraper to take advantage of its high hp ratios by maintaining fast, yet safe haul speeds.

DUCK-WALKING



MANEUVERS EASILY

There are no steering brakes to rob you of tractive power. Instead, direct hydraulic rams turn the tractor in the desired direction of travel. Steering is sure and positive—even going down extremely steep slopes in loose footing.

By swinging tractor left and right with the steering rams, the Allis-Chalmers Motor Scraper can duck-walk through heavy going where others bog down.

Backing up in close quarters is simple. Two-wheel tractor has complete control over scraper body . . . can even change directions without forward or backward movement.

WEIGHT DISTRIBUTION EMPTY

34 PERCENT 66 PERCENT

COMPLETES THE ROUND TRIP QUICKLY

The return trip from the fill is usually uphill. That's where two-wheel design pays off. When empty, 66 percent of the Motor Scraper's weight is carried on the traction wheels. There are no front wheels to rob drive wheels of tractive weight or to create rolling resistance in heavy going. This enables the Motor Scraper to make the round trip faster and usually in higher gear than other units.

SIGN MAKES SENSE

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Crucible Hollow Drill Rods being used in excavation for new Socony-Vacuum Bldg. Owner: Galbreath Co. General Contractor: Turner Construction Company.

they're using

CRUCIBLE HOLLOW DRILL RODS

on the Socony-Vacuum Building job

Across the street from New York City's Chrysler Building, the Slattery Contracting Company is busy moving a city block of earth and hard rock. They're preparing the way for construction of the new 42-story Socony-Vacuum office building.

It's another tough job on which thousands of tons of rock must be moved... and since Crucible Hollow Drill Rods are *first choice* for tough jobs, you'll find them being used extensively on this one. Construction men *know from experience* they can rely on Crucible Hollow Drill Rods for top performance.

That's because Crucible makes its hollow drill rods to *tool steel* standards. That means you'll have fewer broken rods, greater operating efficiency... *lower cost per foot of hole drilled*... when you specify Crucible Hollow Drill Rods.

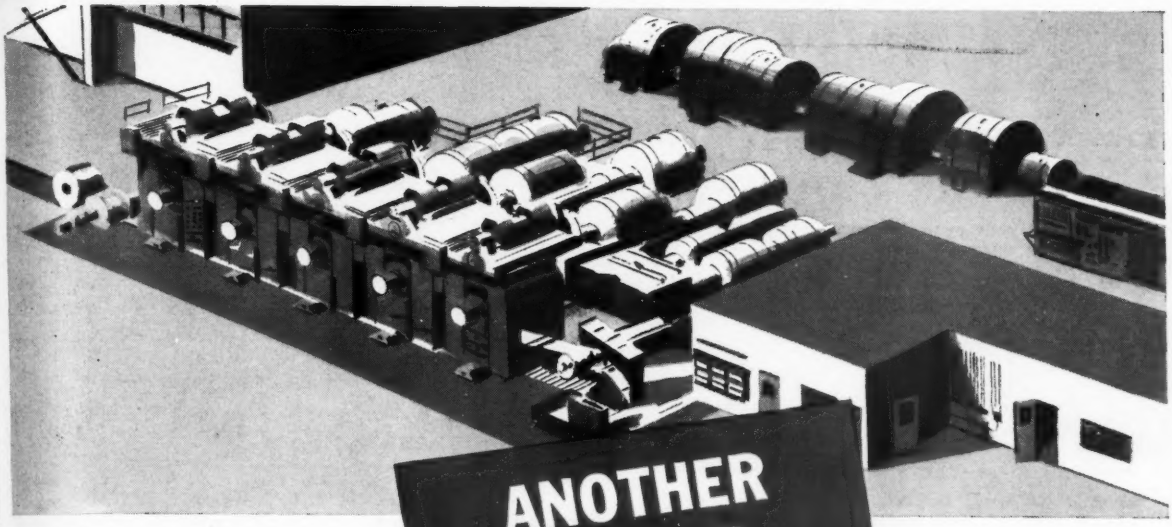
CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW DRILL ROD**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

Canadian Distributor — Railway & Power Engineering Corp., Ltd.



ANOTHER BIG JOB DONE BETTER

WITH NATIONAL BRUSHES
TRADE-MARK

NATIONAL CARBON has, for years, analyzed and supplied the proper brushes for large, steel-mill-production equipment.

TYPICAL EXAMPLE is a five-stand tandem cold mill of the type shown, covering just about the widest range of motor types and brush requirements found in any integrated unit. Calling upon its long experience and diversified product line, National Carbon recommended a specific brush grade for every electrical component in the mill, from pump motors to main drives.

RESULTS were outstandingly successful. Production was established at a high level of availability and has continued at the same rate.

NATIONAL CARBON COMPANY works closely with equipment manufacturers, power companies and principal users of industrial power. Customers know that for *all* motor and generator problems, no other brush supplier can match National Carbon's combination of experience, product-diversification and service-facilities.

Let "National" brushes show you how good really good brush performance can be!

ELECTRICAL AND MAINTENANCE SUPERINTENDENTS!
Give Your Men This FREE Maintenance Course

Mail coupon and receive as many copies as you need — without obligation. Short, entertaining, instructive installments. Profusely illustrated. Quick reference for many day-to-day maintenance problems. Useful for trainees. First mailing includes all back issues.

GET IT NOW!

Send me_____copies of each installment of your DIGEST. I understand that this service in no way obligates me to NCC or to the use of its products.

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____
(please print or type)

DEPT. MC 10-4

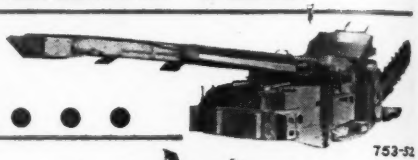
The term "National", the Three Pyramids device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.
District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco
IN CANADA: Union Carbide Canada Limited, Toronto

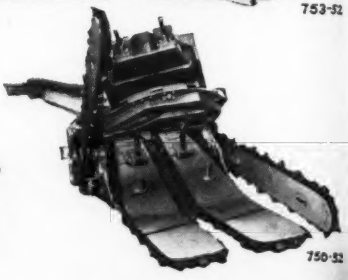
749-52

JEFFREY 34-F MINING MACHINE

fast . . . flexible . . . field-proven

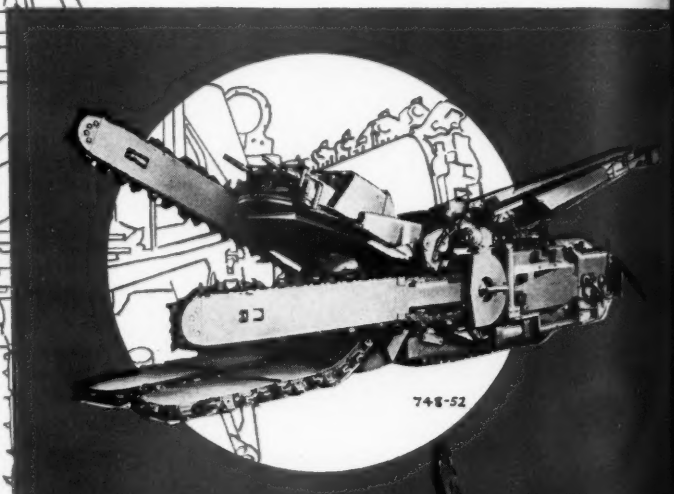


753-52

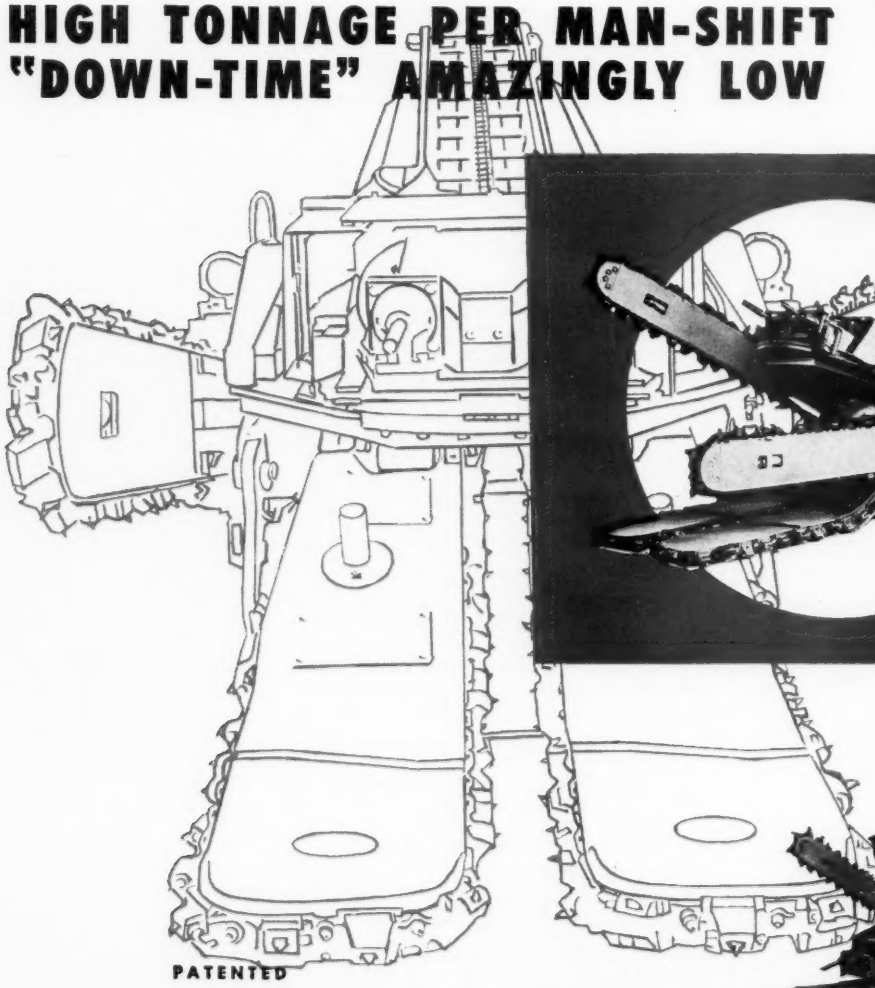


750-52

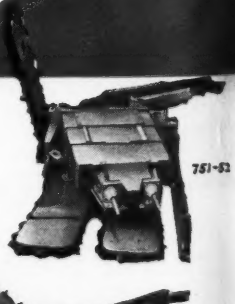
HIGH TONNAGE PER MAN-SHIFT
"DOWN-TIME" AMAZINGLY LOW



748-52



PATENTED



751-52

746-52

If you want a reliable continuous-type mining machine that gives high tonnage per man month-in month-out . . . that stays in operation at the face a peak percentage of time . . . that holds maintenance to rock-bottom level . . . that is fast and flexible . . . that has been thoroughly field proven — then here is the answer: the patented Jeffrey 34-F.

The crawler-mounted 34-F is totally unlike any other continuous-type mining machine now on the market. Twin cutter bars undercut the coal seam; two shear bars shear the ribs, and two vibrating hammers with a 15-ton wallop hit the coal 1800 times a minute to vibrate it loose. The undercutting chains carry all the coal into the discharge conveyor, leaving a clean bottom for shuttle cars and other equipment. The 34-F does all this work — yet it is only 6½ ft. wide and 30 ft. long, including the conveyor.

The 34-F is fast and flexible for every application from development work to pillar extraction. It trams at 104 ft. per minute — high speed for safer pillar recovery. Shear bars operate independently of each other. Undercutting bars are adjustable from 7½ inches below the pavement to 27½ inches above to follow bottom rolls and provide clearance for tramming. Conveyor swings 60 degrees either side of center and elevates to load shuttle cars properly. Hammers raise and lower, swing right and left, advance 34 inches or retract completely for effective positioning any place between the shear bars from roof to top of undercut. The 34-F's flexible movements, as illustrated on the opposite page, are unequaled in any other continuous-type mining machine.

These 34-F machines are now delivering a substantial share of the production in the mines of a big steel company. Lengthy production surveys in a mine using 34-F's exclusively show that with a crew of three or four, each 34-F mined — day after day — an average of over 165 tons per shift. This was more than 40 tons for each man at the face and about 16 tons for each man on the entire payroll. The machines operated 60% of the total face time!

Four types of 34-F's are offered, for coal 56" to 108" in height. Shear bars and undercutting bars have water spraying system. The automatic Trabon grease system, which lubricates 40 points simultaneously, is standard equipment.

Jeffrey district office salesmen have complete information on the 34-F. Call or write your nearest Jeffrey office. Find out how reliable continuous mining can be with the Jeffrey 34-F Mining Machine.

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

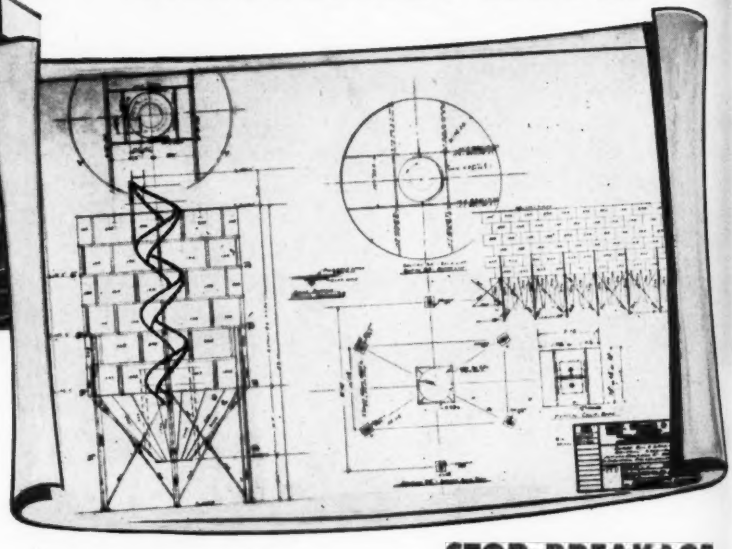
sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED . . . IT'S A JOB FOR JEFFREY!

Now...equipment for HANDLING, STORING *and* PREPARING *coal*

engineered to your individual needs...



THIS INSTALLATION of a Holmes Lowering Spiral and Coal Storage Bin (Steel Type) was made at the Jamison Coal & Coke Co., Mine 21, Hostetter, Pennsylvania.

It was preceded by a careful survey of the requirements and was *individually engineered* to do the job for which it was intended.

STOP BREAKAGE LOSSES WITH HOLMES LOWERING SPIRALS

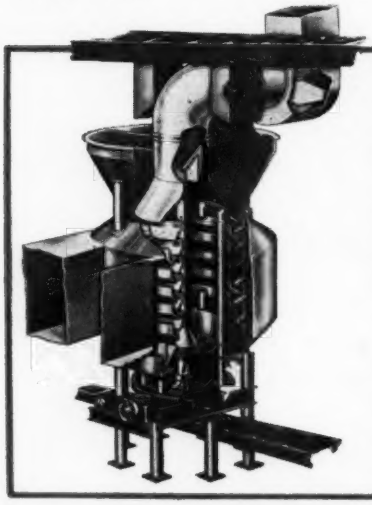
- **No droppage to degrade your coal**
- **No wear and tear on bins**
- **Costs nothing to operate** (gravity operated)

Robert Holmes Lowering Spirals are designed to lower material through the use of centrifugal force, thus eliminating the need of an inside retaining lip. Each spiral is formed like a well-banked race track. The coal automatically slows down when it reaches the "safe" speed limit, regardless of the distance of travel.

As there is no retaining lip, the coal slides gently off onto the peak of the pile to form a natural angle of repose. In this way, the coal is spread out uniformly . . . a real advantage where segregation is a problem.

Lowering spirals are essential to proper handling in surge bins, run-of-mine storage bins and pockets, mine retail sales bins, and consumer storage systems.

For free literature and complete details write Dept.



DRY UP TO 60 TONS PER HOUR IN *ONE* PASS!

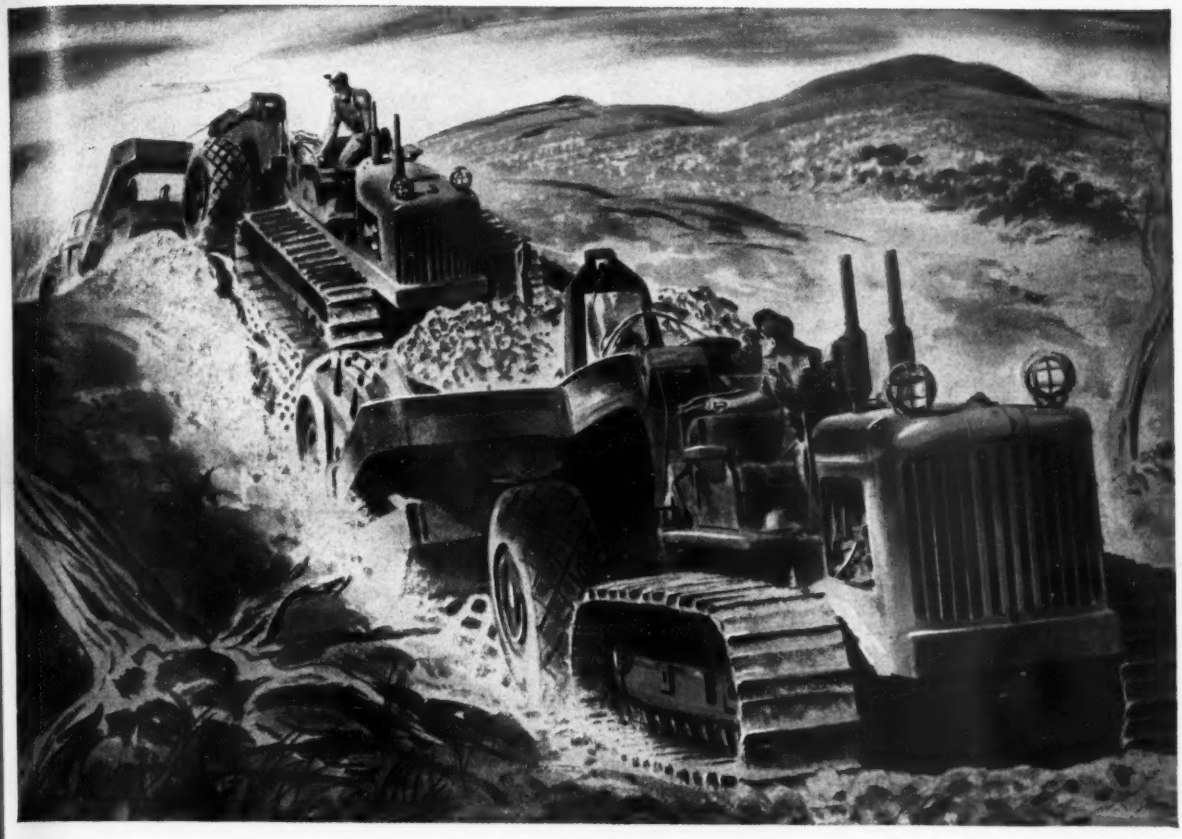
Baughman VERTI-VANE THERMAL COAL DRYER

Both low in initial cost and operating cost . . . each Verti-Vane unit is designed for capacities from 15 to 60 tons. It handles all coal sizes from 1½" down. Reduces surface moisture to approximately 2% in a "one-pass" operation. Minimum of moving parts and slow-speed operation tend to eliminate shift breakdowns and lost time. Easily adjusted for feed conditions . . . requires little attention.

Write for Free Catalog No. 101 Today. Please address Dept. C-9

ROBERT HOLMES & BROS., Inc. DANVILLE ILLINOIS

Manufacturers of: SHEAVES, TIPPLE EQUIPMENT, CAGES, SKIPS, LOWERING SPIRALS, CAR PULLERS AND RETARDERS, DRYERS, LABORATORY CRUSHERS, HOISTS, VIBRATING SCREENS, DUSTOLATORS.



MODERN SCHEDULES DEMAND—POWER...

FLUID POWER

DUDCO DIVISION
Hazel Park, Mich.
Dual-Vane Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation. Piston-Type Pumps for 5000 psi.

HYDRECO DIVISION
Cleveland, Ohio
Gear-Type Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 3 to 52 hp; Cylinders; Control and Auxiliary Valves; 1500 psi.

WATERTOWN DIVISION
Watertown, N. Y.
Railroad air brake valves for freight and passenger equipment, STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

KINNEY MANUFACTURING DIVISION
Boston, Mass.
Rotating Plunger and Heliquad Liquid Handling Pumps, to 3000 gpm. Vacuum Pumps, 0.2 micron, evacuate 1800 cfm.

AURORA PUMP DIVISION
Aurora, Ill.
Liquid Handling Pumps, Centrifugals, 4000 gpm, 500 ft. heads. Turbine-Types, 7000 gpm. Condensate Return Units.

Vehicles that haul 75 ton loads... Shovels that handle 16 yards and more at a single bite... these are but two of the many juggernauts that move mountains or mole hills... that give industry *higher production at lower cost.* And the key to velvet-smooth control of all this harnessed energy is Fluid Power!

Mine, Construction, Marine, Oil Field, Farm and Materials Handling Equipment attain ever-increasing productivity through the rugged dependability of Fluid Power. Machine Tools, Presses, Paper Machinery, Petro-chemical and other processing equipment achieve greater automation plus micrometric precision through Fluid Power.

There are three divisions of The New York Air Brake Company which concentrate on the development of advanced design hydraulic equipment for this Fluid Power. Thus, from a single source, industry may have the ideal component for the specific function. . . . Gear, Dual-Vane and Piston Pumps, embracing a full range of capacities and pressures to 5000 psi, and Motors, Control Valves and Cylinders to develop complete hydraulic circuits.

In addition to Fluid Power, industry finds the answers to its liquid handling problems in Aurora and Kinney Pumps. "Any material that can be pushed through a pipe"... from gasoline and alcohol to tars, sludges, slurries and other heavy semi-solids ...and the less dramatic tasks of sump, deep well, boiler feed, and household needs are all dependably handled by these famous pumps.

Write today for literature containing hundreds of ideas for you to improve your product, increase production and lower costs.

THE NEW YORK AIR BRAKE COMPANY

230 PARK AVENUE • NEW YORK 17, N. Y.

Here's another

The union of the bit and the rod after drilling has a cohesive strength of several tons . . . A sharp blow of sufficient weight on the end of the bit skirt will serve to detach the bit from the rod.

SPECIFICATIONS

Mines everywhere cut drilling costs with CRD DETACHABLE DRILL BITS • 4 - Wing Type - Center Hole - Side Hole

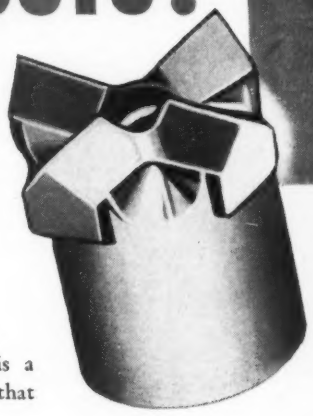
Class "A" Bits For class "A" drill steel connection on any steel. Best suited to ⅞" steel.		
	1-1/4	Aluminum
	1-5/16	Pink
	1-3/8	Deep Green
	1-7/16	Brown
	1-1/2	Grey
	1-9/16	Maroon
	1-5/8	Deep Blue

Class "B" Bits For class "B" drill steel connection on any steel. Best suited to 1", 1⅛" and 1-¼" steel.		
	1-7/16	Orange
	1-1/2	Green
	1-9/16	Yellow
	1-5/8	White
	1-11/16	Black
	1-3/4	Red
	1-13/16	Blue
	1-7/8	Tan
	1-15/16	Plain
	2	Pink
	2-1/8	Maroon
	2-1/4	Aluminum

Cans are labeled showing size of steel socket, gauge of bit, and color.

rway to cut drilling costs!

Use CLEVELAND one-use CRD Detachable Bits



Lower cost per foot of hole—that's the goal of everyone who has rock to drill. And that was the goal of CLEVELAND engineers, too. They didn't fool around with the problem either. Fifty years of experience in designing rock drills was put to work. The result—a one-use detachable bit that can save you money in a wide variety of applications.

This designing job wasn't done overnight. You can't produce the results our engineers were after in such a short time. Instead, these bits were put to work—and, for a number of years they have helped reduce drilling costs materially in mines, in quarries, and on construction jobs.

That's why we offer them to you now—with complete confidence in their ability to help you improve your rock-drilling cost picture.

These Features Mean Lower Drilling Costs for You

Faster Drilling Speed—Special offset gauge feature, which permits the use of thinner wings and a steeper reaming angle, greatly reduces binding and provides ample clearance for cuttings. Result is a free, fast-cutting chiseling action that gives you greater drilling speed.

Less Drill-Steel Breakage—The method of attachment used with the CRD bit eliminates threads on the drill rod. Since a drill rod is only as strong as the root diameters of its threads, the tapered threadless CRD design provides longer drill-steel life—reduces drill-steel handling and reconditioning costs.

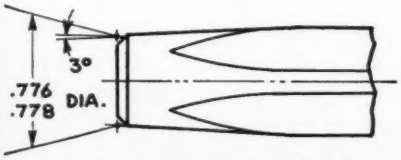
Lower Rock Drill Repair Costs—Because the CRD bit design reduces binding in the hole, there is less strain on the rotation parts of your rock drills. Rifle bars, rifle nuts, and chucks last longer. You get more drilling done at lower cost.

Since no special equipment is needed to thread rods, you owe it to yourself to try a can of CRD bits. They're ideal for roof bolting and for use in your stopes as well as in your headings. A short trial will give you first hand information on the ability of these bits to cut drilling costs in your property as they have in so many others.

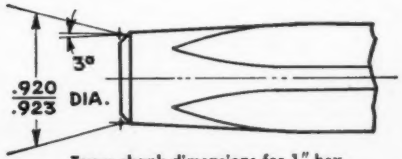
Bulletin RD-29 gives detailed information. A copy is yours for the asking—just write for it. **RD-58**

CLEVELAND ROCK DRILL DIVISION
Westinghouse Air Brake Co.
12500 BEREA ROAD • CLEVELAND 11, OHIO

Plants: Milwaukee, Wis. • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Mich.



Taper shank dimensions for ⅞" steel.
Class A Bits



Taper shank dimensions for 1" hex,
1" Q.O., 1⅛" and 1¼" rd. steel.
Class B Bits

The taper attachment shank used with the CRD bit is easy to make. You need no dies or other expensive threading equipment. Several simple, low-cost methods can be used for preparation — grinding, forging or machining.

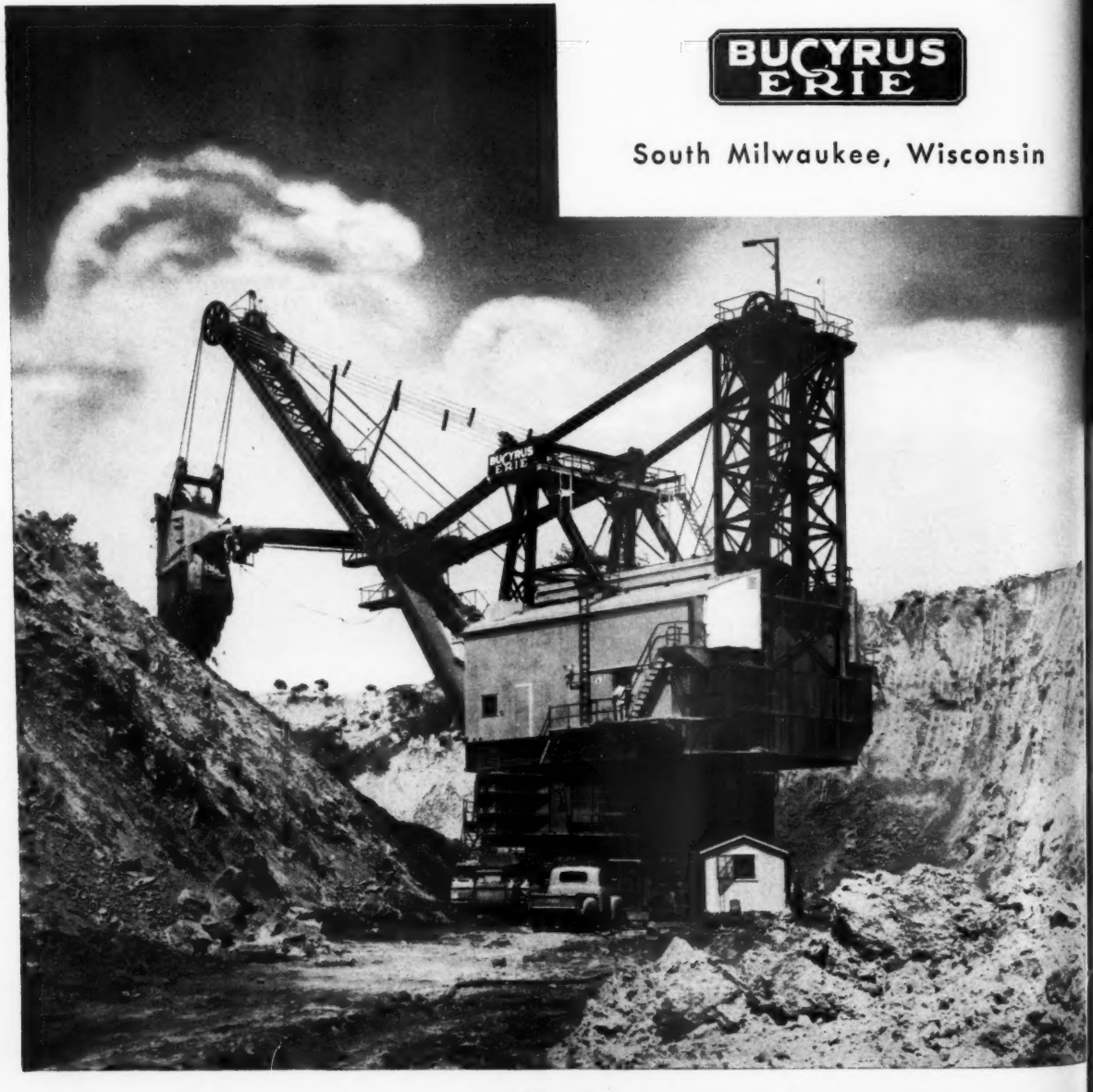
No place for little ideas...

In large scale mining, the problems are big and ideas for solving them must measure up. Experienced strip mine operators know that Bucyrus-Erie stripping shovels and draglines offer the right answer — really big output, along with dependability and economical operation. In addition they provide long working ranges, time-saving maneuverability, and the basic simplicity of design that means low maintenance costs.

If your mining operation requires the economical handling of big yardages, investigate Bucyrus-Erie stripping shovels and draglines. 16L54

BUCYRUS ERIE

South Milwaukee, Wisconsin



Now available! Superior insulation featured in new Cyanamid blasting caps

AMERICAN CYANAMID COMPANY
EXPLOSIVES

Cyanamid has for many years been conducting a study of all materials available for blasting cap wire insulation to find one that would offer uniform concentricity—no thin spots. Every type of insulation currently in use has been tested, as have many new materials. Now Cyanamid has an insulation that gives *uniform concentricity*, assures maximum performance!

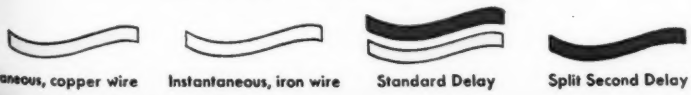
This new, organosol plastic insulation is applied to wire by a continuous bath method. The wire is dipped in *seven separate baths* and is passed through dies to scrape off excess coating between baths. Each coat is heated to insure perfect set, perfect concentricity. Organosol plastic insulation, because of its uniformity, gives you:

1. **Greater electrical insulation values**
2. **Greater flexibility**
3. **Greater abrasion resistance**
4. **Non-porosity**
5. **Greater moisture resistance**

Capable Field Engineers Are Available At Your Call

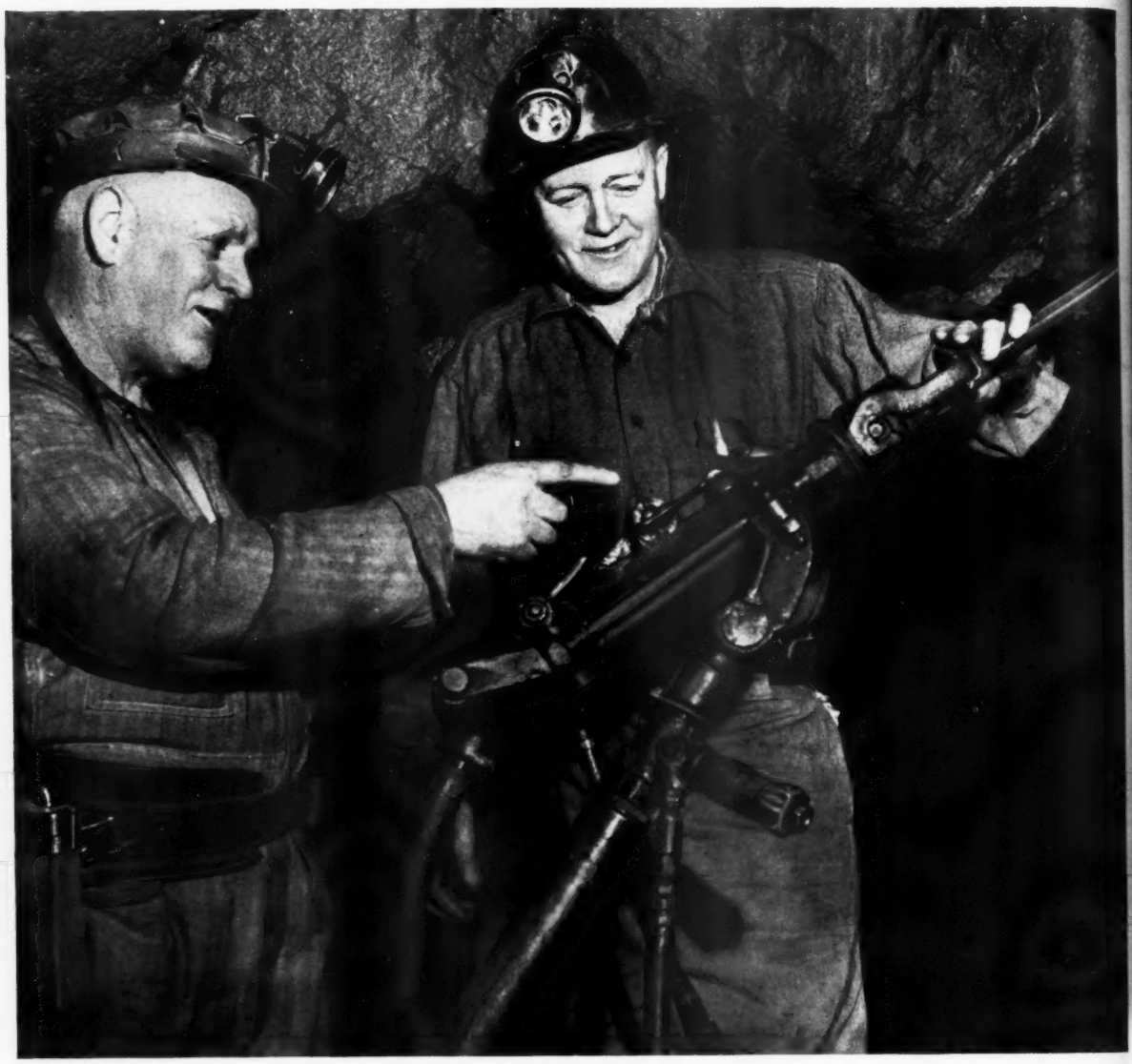
HIGH EXPLOSIVES • PERMISSIBLES • BLASTING POWDER
BLASTING ACCESSORIES

Color-Coded for Easy, Sure Identification



stantaneous, copper wire | Instantaneous, iron wire | Standard Delay | Split Second Delay

AMERICAN Cyanamid COMPANY
EXPLOSIVES DEPARTMENT
30 Rockefeller Plaza, New York 20, N. Y.
Sales Offices: Pittsburgh, Pa.; Bluefield, W. Va.; Scranton, Pa.; Chicago, Ill.; Pottsville, Pa.; Maynard, Mass.



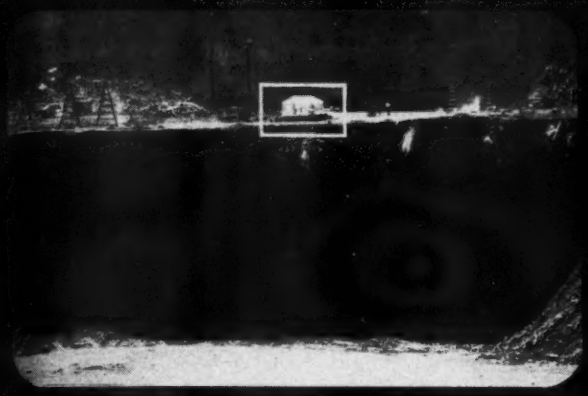
That's right mister! YOU'RE POINTING TO GREATER EFFICIENCY

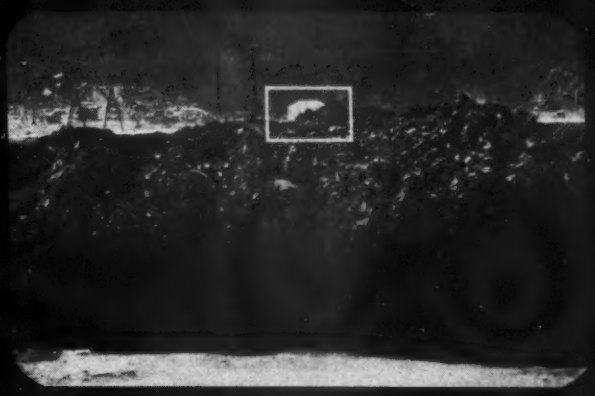
When you point to that CP Airleg combination, Mister, why not point out that they team up to give the maximum drilling efficiency obtained when using Tungsten-Carbide bits. And that the leg takes constant recoil shock yet holds the drill firmly to the work. And while you're at it, point to the exclusive pressure release type control handle and balanced feed leg that assure steady bit pressure even under variable line pressure and different rock formations – eliminate "slapping" and reduce bit breakage. Then point to the emergency push button that releases feed-leg pressure instantly. Point out that it's available with a feed cylinder of either steel or aluminum alloy and with 36″ and 48″ feed travel. And that it makes a perfect combination . . . the Chicago Pneumatic Airleg and Sinker Drill! And if your friend has any more questions, Mister, ask him to write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

Chicago Pneumatic

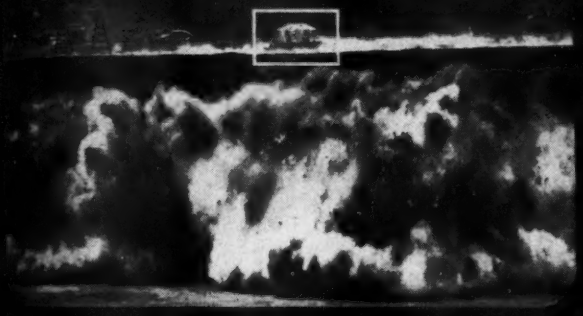
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

"Less shake...

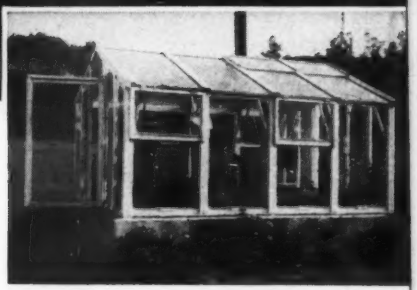




Less noise...



No broken glass..."



WITH the help of the ROCKMASTER® blasting system and a greenhouse, the North Jersey Quarry Co., Millington, N. J., has built good community relations. They proved to nearby neighbors that their blasting produces less vibration in a dwelling than that of a slammed door.

The greenhouse is only 48 feet from the quarry face. Yet after the blast there wasn't a single crack in a pane of glass . . . the concrete foundation was in perfect condition. That is convincing evidence for any neighbor worried about his home.

By initiating the blast at the bottom of the holes . . . the point of maximum confinement . . . the ROCKMASTER blasting system keeps the explosive force confined where it does all its work on the rock. There is minimum air blast, no wild flying rock, no wasted explosives power . . . a well broken, easy-to-dig pile is the final result.

For quarrying, mining and construction work, see how ROCKMASTER can increase your blasting efficiency and improve your public relations. Ask your Atlas representative for a copy of the new Atlas Explosives Catalog that is just off the press.

BLAST DATA:

Number of holes	9
Average depth	56′
Spacing	17′
Burden	6 to 20′
ROCKMASTER delays	0 through 8
Average stemming	17′
Diameter of holes	6″
Total powder (Apex #4 HV and #2 MV)	3025 lb.
Rock produced	14,000 Tons
Powder factor	4.63
Loading started	8:30 AM
Loading finished	10:30 AM
Blast fired	11:15 AM

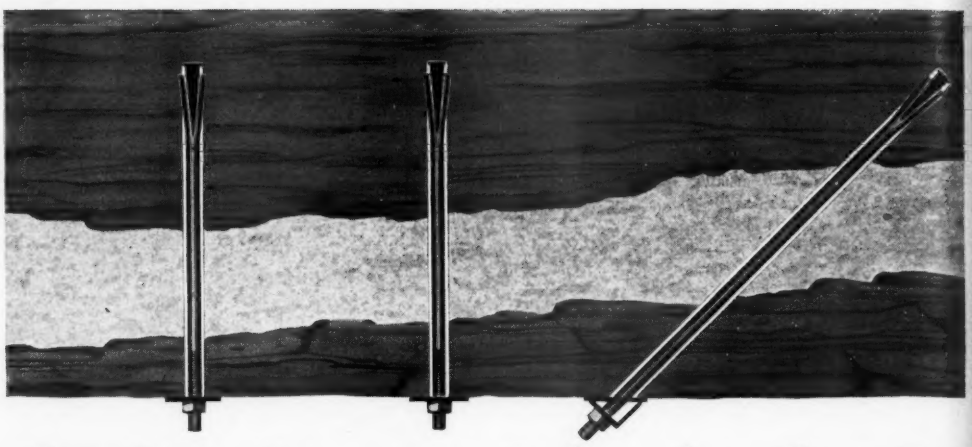
ATLAS

ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY,
WILMINGTON 99, DELAWARE

Offices in principal cities



Roof Bolting Promotes Safety by Clamping Roof Strata into Thick Beam

HOLDS STRATA AS SINGLE UNIT

Roof bolting makes any mine a safer, more productive mine. This is because the bolts consolidate several strata into a single-unit thick beam.

Besides providing increased safety for workers, roof bolting also helps to step up production, because there are wider clearances and increased room in which to operate mechanized equipment. Ventilation is improved, too.

To facilitate economical roof bolting, Bethlehem manufactures a slotted bolt, which is used with a steel wedge; also three types of roof bolts for use with expansion shells. All four types of bolts come in lengths of from 2 ft to 8 ft. For additional details, get in touch with the nearest Bethlehem office.

SLOTTED BOLT A 1-in. bolt having a centered, forged slot. No material is removed when slotting. Other end of bolt has 5 in. of rolled threads. Intended for 1¼-in. hole. When bolt is driven against back of hole, steel wedge is forced deep into slot, expanding ends of bolt. Truncated-cone point prevents thread damage. Usually supplied with American Standard Regular Square Nut.

SQUARE-HEAD ROOF BOLTS (Three types)

1. Square-head ¾-in. carbon-steel bolt.
   Minimum breaking load, 20,000 lb.
2. Square-head ⅞-in. high-strength bolt.
   Minimum breaking load, 20,000 lb.
3. Square-head ⅞-in. high-strength bolt.
   Minimum breaking load, 40,000 lb.

Bethlehem's square-head bolts come with or without ears on the shanks, to accommodate the Bethlehem 4-leaf Type C expansion shell, or the matching-halves Type F expansion shell.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM MINE ROOF BOLTS

WORLD'S LARGEST MINE LOCOMOTIVE

At Mathies Mine

USES O-B TROLLEY SHOES

New, powerful 50-ton mine locomotive is able to pull 110 of Mathies' loaded mine cars (1,600 tons) on straight level track; hauls normal loads of 45 to 50 cars against a 2% grade.

O-B Type-M Trolley Shoes have been selected to handle the extra heavy currents required for the locomotive's four 150-horsepower motors.

Curved bearing on O-B Shoes keeps them in full contact with trolley wire at varying heights and high speeds... while proper depth of groove assures positive "following action."

Exclusive fiberglass insulation on shunt withstands high temperatures that result from hauling such heavy loads.

O-B Trolley Shoes can provide the same satisfactory service for you. Choose between the Type-M Shoe, illustrated below, which has been designed for operating on currents of 2,000 amperes and above, or the Type-L Shoe designed for the most efficient and economical service on currents below 2,000 amperes.

Ohio Brass

MANSFIELD OHIO, U. S. A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

4501-M

Introducing... Most power! Most speed in the heavy-duty, ¾-yard class!

It's the LS-88 . . . another NEW Link-Belt Speeder

LINK-BELT SPEEDER does it again! LS-88 is the first heavy-duty ¾-yard shovel-crane with world-famous Speed-o-Matic power hydraulic control! This exclusive feature puts the operator in a class by himself. He works easier, faster, with less fatigue. Also, greater net hp puts more production at his fingertips.

And there's reserve maintenance-saving stamina—more "live" machine weight—to utilize this extra hp. It all adds up to more production minutes, yards-ahead output capacity . . . shift after shift, job after job!

SPECIAL NOTE TO TODAY'S SHOVEL-CRANE BUYERS

Before you buy a shovel-crane of *any* capacity for *any* application, check first with your Link-Belt Speeder distributor. Link-Belt Speeder is moving ahead with several great new machines—available NOW and offering exclusive advantages for you!

LINK-BELT SPEEDER CORPORATION, Cedar Rapids, Iowa

Typical LS-88 standard equipment features

- **Longer lining life**—Internal expanding clutches with alloy cast iron clutch shells give superior friction and wearing qualities.
- **Greater horsepower** — 91 net hp at full load speed.
- **Splined shafting and anti-friction bearings** throughout upper main machinery.
- **Patented advanced crawler** — self-cleaning, smoother travel, longer life.
- **Independent rapid boom hoist** — with power control up *and down*.
- **Gears running in oil** — all horizontal deck gears and swing-travel bevel gears enclosed and run in oil.

13,673-A

LINK-BELT SPEEDER

BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND WHEEL-MOUNTED SHOVEL-CRANES

SYMONS VIBRATING ROD GRIZZLIES for heavy duty big capacity scalping from ½" up to about 4".

SYMONS VIBRATING BAR GRIZZLIES for heavy duty large capacity primary scalping from 1½" upwards.

SYMONS VIBRATING ROD DECK SCREENS for low cost, big capacity screening of wet and sticky material.

SYMONS® SCREENS

...from the *HEAVIEST SCALPING*

...to the *FINEST SCREENING*

SYMONS HORIZONTAL SCREENS for level, positive screening with greater capacity of more accurately sized products . . . ideal for asphalt plants—with drive *outside* dust and heat.

● *SYMONS VIBRATING SCREENS* have been serving the non-metallic minerals industry for almost twenty years. The wide range of types and sizes enables you to select the *right* screen for your particular application.

These quality screens have gained an enviable reputation for dependability, efficiency and economy... backed by the same high standards of accuracy, design and workmanship, and the same advanced engineering that is used in the manufacture of *all* Nordberg Machinery.

Mail the coupon for further details.

SYMONS "V" SCREENS for big capacity single cut wet or dry separations—even in much finer meshes than possible with conventional screens.

SYMONS... A Registered Nordberg Trademark Known Throughout the World

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
TORONTO • MEXICO, D.F. • LONDON • JOHANNESBURG

MAIL THIS COUPON TODAY

NORDBERG MFG. CO., Milwaukee, Wisconsin MCJ

Please send me further information on the following screens for coal preparation service:

☐ Symons Horizontal Screens ☐ Symons "V" Screens
☐ Symons Rod Deck Screens ☐ Symons Grizzlies

Name_____ Title_____

Company_____

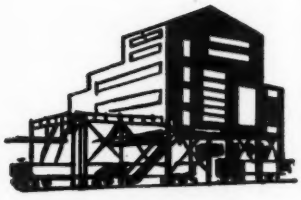
Address_____

City_____ Zone_____ State_____

S254

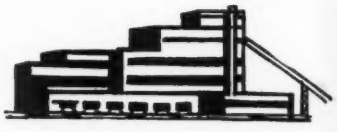
A 50 YEAR *Partnership*

R AND S COMPANY



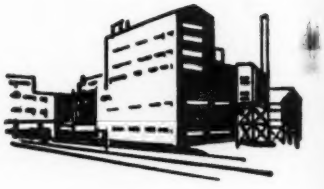
with the

Coal Mining Industry



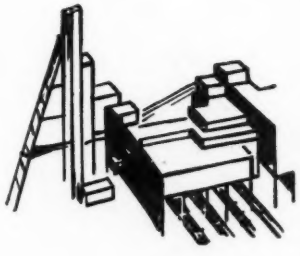
On September 26th, Roberts & Schaefer Company completed fifty years of such close association with the coal mining industry that we have come to think of it as a partnership.

These have been years of accomplishment, both for the industry and ourselves. The mining companies have worked diligently and consistently to provide a better product; we have worked with them to supply the preparation process best suited for their requirements. During these years R & S Coal Preparation Plants have been installed in major mines throughout the United States and in many foreign countries.



Each of these preparation plants has been designed with the exact equipment required by the individual mine. Roberts & Schaefer Company is able to supply its own Super-Airflow Cleaner for air washing, the Hydrotator and Hydrotator Classifier for wet washing, and Heavy Media Separators for difficult cleaning problems.

As a further service to the industry, full-size units of each of these methods have been consolidated in the R & S Pilot Plant at Harvey, Illinois and are available to test carload quantities under actual operating conditions to determine in advance the method required for consistent, low-cost preparation. An outside, unbiased laboratory report of all end products is then supplied with R & S recommendations.

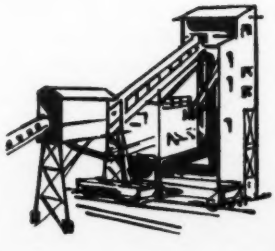


The establishment of this pilot plant is an indication of our confidence in the continued activity of the coal mining industry, and we look forward with assurance to another fifty years—and more—of working together to our mutual advantage and accomplishment.

ROBERTS and SCHAEFER COMPANY

130 North Wells Street, Chicago 6, Illinois

Henry W. Oliver Bldg., Pittsburgh 22, Pa.
254 West 54th Street, New York 19, N.Y.
P.O. Box 570, Huntington 10, W. Va.
P.O. Box 675, Hibbing, Minnesota
Foreign Department: International Mfg. & Equipment Co., Inc.
220 Broadway, New York 38, N.Y., U.S.A.



R & S Pilot Plant at Harvey, Illinois built and maintained for the sole purpose of testing coal cleaning methods under actual operating conditions.

★ Mining CONGRESS JOURNAL ★

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
JOHN C. FOX, Editor

VOLUME 40 OCTOBER, 1954 NUMBER 10

Another Forward Step

ON several occasions during the past year the pages of MINING CONGRESS JOURNAL have reflected the concern of mining company executives and leading educators over the dearth of young engineers entering the mineral industries. Throughout these discussions, there was general agreement that an almost complete ignorance of the opportunities and rewards offered by a career in the mineral industries was largely responsible for the apathy with which young people view this basic industry when it comes to choosing their life's work.

It was also generally agreed that the responsibility for dispelling this ignorance rested on both our educational institutions and on the mining companies themselves. Several pamphlets have been published in the past to help bring the opportunities the mineral industries offer to the attention of the rising generation. To achieve this they were distributed to many schools and colleges throughout the country. There is no doubt that such publications have been effective and were a step in the right direction.

Just recently our attention was called to a newer publication, "Your Future in Mining Engineering," published by the Michigan College of Mining and Technology with the cooperation of 19 mining companies and executives. Its wide circulation among high school counselors, school libraries and mining engineers marks another forward step.

The booklet in its 20 illustrated pages gives succinctly the facts a young man should know before choosing a career in any industry. It defines briefly what a mining engineer is, discusses realistically, with figures, how many new engineers the industry can absorb each year, what jobs are open to the engineer and what his duties will be. It tells what rewards the engineer in the mining industry can expect throughout his career. Finally, and perhaps most important, it poses the questions every young man should ask himself to determine whether he has the attributes necessary for a career in mining.

Dr. Riddell and the 19 forward looking mining companies and executives who made this new booklet possible are to be congratulated on their fine cooperation in performing a task that will benefit the entire mining industry.

Many Happy Returns

MANY of our readers have noticed the A.B.C. insignia that appears on page five of MINING CONGRESS JOURNAL, usually in the lower right-hand corner. To the advertiser it is the hallmark of quality just as the "sterling" on a piece of silver attests to its quality. To the reader it means that the editorial staff of the periodical that carries this mark is constantly trying to serve him better.

This little seal proclaims that along with 2692 other periodicals in the United States and Canada, MINING CONGRESS JOURNAL belongs to the Audit Bureau of Circulation. This voluntary, non-profit, cooperative association performs for the publishing industry what the assay umpire does for the mining industry. Every year the Bureau's auditors carefully examine the books of each member and publish an impersonal unbiased assay of its progress.

Prior to October 1914 there were no reliable standards by which the effectiveness of a publication could be measured. In October 1954 there is no stricter test of circulation value than A.B.C. membership.

On this, the Fortieth Birthday of this outstanding example of self regulation and free enterprise in action, MINING CONGRESS JOURNAL is proud to join with the more than 3575 advertising agencies and other publisher members in saluting the Audit Bureau of Circulation.

Up to 60 ft of overburden is handled by the stripping shovel without being shot

Strip Land Reclamation at Little Sister

Forward Looking Management Develops System for Reclaiming Strip Mined Land and Making it Pay

By GEORGE W. SALL

OUT in west central Illinois, the Little Sister Coal Corp. is doing a noteworthy job of rehabilitating land disturbed by strip mining. Through a subsidiary organization, Little Sister Farms, the company is successfully striving to return the land to a high level of productivity after mining has passed by.

Little Sister strip mines the Illinois No. 5 coal seam near St. David, Fulton County, Ill.—right in the center of a rich farming area. Not only is the company improving public relations with the conservation-minded neighboring farmers by its reclamation work, but it is making its farm program pay.

Part of the secret of the company's success with its reclamation program lies in the type of overburden present. The five ft of coal is overlain with 2½ to 4 ft of slate; 6 to 24 in. of limestone "cap rock"; 20 to 40 ft of blue shale; and 20 to 30 ft of sandy loam. The material is easily handled by shovel and drag line and does not have to be shot until overburden gets over 40 ft thick. Physical and chemical properties of the disturbed land are such that an impressive rehabilitation job can be done.

Fulton County and neighboring Knox County, Ill., are fortunate in having such favorable natural conditions for reclaiming strip-mined land. There are few, if any, other coal mining areas in which conditions are so favorable. This is not to take anything away from the mine operators in Fulton and Knox Counties. True, they have conditions favorable to reclamation work, but it is also true that they

Grading is 90 percent complete after mining

are taking every advantage of these conditions to return mined land to productivity.

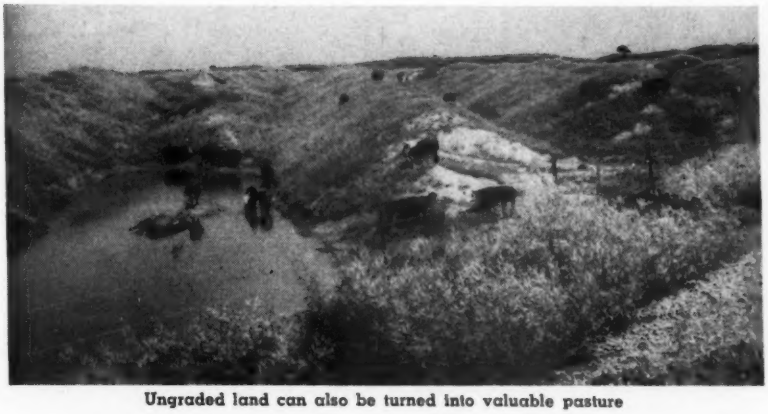
It is interesting to note that most of the coal mining fraternity in that area refers to "disturbed" land rather than to stripped land or spoil. Not only is this done in the interest of good public relations, but the mine operators are truly conscious of rehabilitation work. They sincerely feel that strip mined land is only disturbed, not spoiled. There is a lot to be said for this philosophy.

History

Little Sister Coal Corp. took over the strip mine property of the Central States Collieries, Inc., ten years ago. At that time, 1039 acres had been disturbed by strip mining. Reclamation work in the form of tree planting had been started on the property in 1938 and by 1944 approximately 137,600 trees had been planted.

Emphasis has now shifted from planting trees to bringing the land back into productivity by turning it into pasture and grazing livestock on it. Tree planting has not been forgotten, however, and in the spring of 1953 approximately 25,000 evergreens were planted on disturbed land for Christmas tree production.

In general there are three ways to prepare disturbed land for rehabilitation. It can be left untouched after mining; it can be topped (the peaks in the spoil leveled out by a bulldozer) or it can be graded. From a short range point of view, the cheapest method of reclamation is to leave the land alone after mining. Trees can be planted by hand on this land or it can be put to pasture with seeding done either by hand or from the air. However, access with mechanical equipment is difficult, or impossible, and the use of the land is limited.



Ungraded land can also be turned into valuable pasture

Topping permits limited access but does not allow complete utilization of the land with mechanical equipment. Complete grading costs the most, but Ltitle Sister feels that it pays off for them. It allows complete coverage with mechanical equipment and, if soil conditions permit, will allow the planting of row crops. Weed control in pastures can be more effective and hay can be cut.

Grading is a recent development around Illinois strip mines. Not more than 100 acres of disturbed land had been graded in the entire state before 1950. In 1948 some grading was tried on Little Sister land. Rye was seeded on 7.5 acres of the graded plot and became the first harvest of any product from mined land of the Little Sister Coal Corp. This was one of the early graded tracts in the State.

Reclamation Trend Changes

In 1950 conditions were such that the trend in strip mined land reclamation suddenly turned to grading mined out areas. This change was based on a great deal of study, experience with reclamation work and agronomic facts. Management at Little Sister recognized the virtues and decided upon an aggressive program of reclamation based on grading disturbed land. Not only was this program to be directed at land disturbed in the future but to land disturbed in the past also.

Approximately 8000 acres of land are involved in the holdings of the Little Sister Coal Corp. A total of 2600 acres has been disturbed by mining. About 1500 acres of this was acquired from the Central States Collieries and other mining companies and individuals. Five thousand acres are being farmed and about 1600 acres have been put back into productivity through grading.

From January 1, 1950, to January 19, 1954, Little Sister mined the coal on 476 acres of land. From May 1950 to January 19, 1954, the company had graded 761 acres of disturbed land to the point where farm equipment could be used on it. Since January 1954 a good many additional acres have been graded and an average of 40 acres per month is now being reclaimed.

Grading is part of the mining operation and is 90 percent completed with regular mining. This has not been difficult to do with the method of mining practiced at Little Sister.

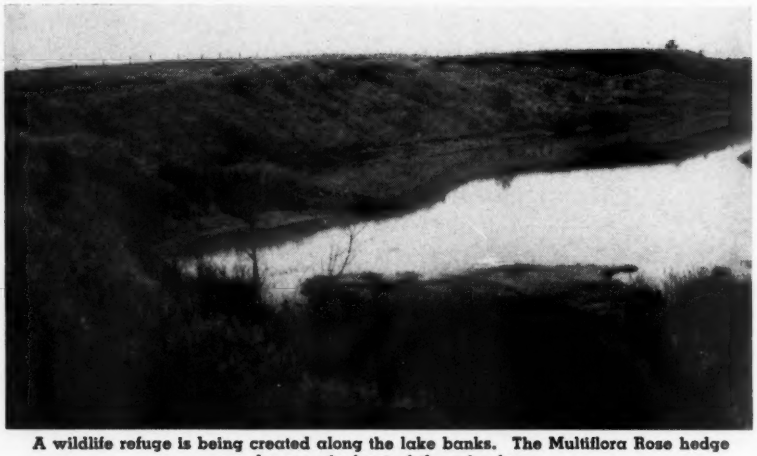
Grade Behind Mining

Coal is stripped with two combination units. Each unit consists of a shovel on the coal and a dragline working on the spoil. The shovel does the actual uncovering and the dragline rakes spoil away from the shovel as it is deposited on the spoil bank. Occasionally a tractor dozer which works in the pit doing such jobs as cleaning up, moving pumps and maintaining roads is called upon to work on the spoil to level for the dragline.

After the rough grading is finished, any large rocks on the surface are picked up to prevent future interference with farm equipment.

Final grading follows. Bulldozers fill in the low spots and knock down

A dragline pulls spoil from the stripping shovel and rough grades the spoil as part of the mining procedure



A wildlife refuge is being created along the lake banks. The Multiflora Rose hedge can be seen in front of the wire fence

the high ones with an eye toward establishing complete drainage in the finished field. This is an important part of the procedure and it takes a good eye to tell where water will drain and where it will stand. Swags and potholes are detrimental. They are not only unsightly but fill with water after every rain, more than likely drowning any crop planted.

A waiting period between rough and final grading allows differential settling to take place and makes final grading more effective.

Fertility Is High

The graded land has a high mineral nutrient content. The only thing lacking is fixed nitrogen and humus. As an example, 49 samples taken and tested by the University of Illinois show the following results:

Acidity	7.5 pH
Phosphorus	169 lb per acre
Potassium	189 lb per acre

For comparison, an average of such tests taken on other Fulton County farm land soils run like this:

Acidity	6.01 pH
Phosphorus	46.7 lb per acre
Potassium	205 lb per acre

A pH of 7 is neutral; 92 lb of phosphorus per acre is high, and 150 to 200 lb of potassium per acre is high. It can be seen that the graded land compares well with undisturbed farm land. An analysis of the physical characteristics show that the graded land contains 15.2 percent sand; 54.8 percent silt, and 30 percent clay. This kind of land falls in the class the agronomists call silt loam, a common soil class.

Although a complete fertilizer has been found unnecessary, nitrogen in the form of ammonium nitrate is applied where indicated at the rate of 150 lb per acre. No fertilizer of any kind is required for basic legume seedings.

Pastures are the immediate and basic objective in the rehabilitation work at Little Sister. Farm management feels the first thing to be done is to build up the organic content of the newly graded land. When the land is ready to be seeded it is first thoroughly disked. The first, or pioneer, seeding is a cover crop the type of which depends on the time of year the seeding is made. Sweet Clover is sowed in the spring, Sudan Grass in the summer, and Rye in the fall. The following spring the cover crop is disked back into the soil and an Alfalfa mixture planted. The pioneer crop, upon being disked back into the soil, adds to the humus. Alfalfa is a legume, and as such posseses the virtue of being able to add fixed nitrogen to the soil and build up its fertility. In addition it makes fine pasture and hay.

Results Gratifying

All seedings have not been immediately successful. However, consistent work in upgrading the pastures has paid off and there is some mighty fine grazing land in use. At present a 325-cow and calf herd is supported on graded land. Grazing is closely managed for maximum forage and maximum beef production. Concentrated grazing is practiced and the pastures are used in rotation. Farm management believes that some of the pastures will approach one head per acre in carrying capacity under this type of management. Besides the cattle being grazed, there are also two pig farms on graded land.

In addition to the pastures, a small area of graded land has been devoted to grapes. Approximately 4000 vines, including Catawba and several varieties of French Hybrids, were planted in 1951 and 1952 on nine acres. Survival was good and growth has been satisfactory.

Most of the 8000-acre holdings of Little Sister Coal Corp. are being operated by Little Sister Farms. Land has been divided into 15 units ranging from 180 to 1800 acres in size, operated by 15 men. Part are operated under a conventional tenant farm lease and part by salaried employes. A total of 30 men are used to carry out the farm program which is under the direct supervision of a farm manager. Each farm is made up of both graded and undisturbed land. This allows a rounding out of the over-all farming program within each individual farm.

In addition to the grading done by the coal stripping units, two bulldozers are worked two shifts per day

(Continued on page 71)

(Left) So far, 1600 acres have been returned to productivity through grading. (Right) The seven miles of lakes serve as a water reservoir for the cleaning plant, the farm irrigation system and for livestock. In addition they are used for fishing by community residents

Trebled plant capacity demanded that larger blastholes be drilled faster in Calaveras' No. 4 quarry

Experience With Large Rotary Drills

Drilling Costs at Calaveras No. 4 Quarry Cut as Much as 77 Percent in Average Rock When Rotaries Replace Churn Drills

By LEWIS A. PARSONS

Consulting Engineer
Calaveras Cement Co.

IN recent years the drilling of large blast-holes in open pits has felt the impact of a basic change in drilling method. First the old miner had his single-jack and double-jack, followed by the cumbersome piston-drill, operated in the early days by steam. Then came the many forms of hammer-drill, some using air and some water as a coolant. When the steadily increasing size of mining operations demanded the efficiency of larger blast-holes, the churn-drill was developed, and for many years was the chief reliance of open-pit operators who were required to break large tonnages every day.

As mining operations grew larger and larger, and the tonnages increased, the defects of the churn-drill became more evident: it was slow, and it was expensive in manpower per foot of hole. Its saving grace was that it did break large tonnages per foot.

Develop Rotary Drills

Meanwhile the oil industry had developed the rotary drill to a high state of perfection. In soft formations, such as the gumbo of the Gulf Coast, the fish-tail bit was adequate; but hard-rock drilling required a different type of bit. The tricone bits, as manufactured by Hughes Tool Co. and Reed Roller Bit Co. were the answer, and would give good footages in all but the hardest rock. Now most of the extremely tough, hard rocks, the cherts and the quartzites, are drilled with reasonable efficiency by the tricone bit faced with tungsten carbide.

Manufacturers watching the inadequacies of the churn-drill were not slow in their attempts to adapt the oil-well rotary rig to blast-hole drilling. It would seem like a simple adaptation to make, but it took many years to develop. Extreme mobility and speed of set-up were required, but the most difficult problem was the cooling of the bit and the removal of the cuttings from the hole. Early designs naturally followed the oil-well pattern, using water or drilling-mud as a coolant, but these did not prove suitable for blast-hole drilling. Four or five years were wasted this way until a new concept, the cooling and removal of cuttings by compressed air, solved the problem. When this had been developed, the rotary drill had arrived.

There are three such drills: the Reich rotary, a moderately-heavy drill mounted on a truck chassis with rubber-tired wheels; the heavier Joy Champion, mounted on crawlers; and the very heavy, massive Bucyrus-Erie 50-R. Calaveras has had experience with only the last two, and, therefore this article will cover only those. For comparisons of cost and efficiency, figures will also be given on the

Bucyrus-Erie 29-T churn-drill, which was used prior to the company's first rotary.

Treble Production

From 1945 to 1954, Calaveras Cement Co. trebled its production, from 3600 to 10,000 barrels of cement per day. The corresponding increase in raw materials, combined with necessary stripping as mining went deeper on the limestone body, brought daily tonnage mined to 10,000, and study was begun on more efficient methods of blast-hole drilling. This resulted in the purchase, in December 1951, of a Joy Heavyweight Champion rotary drill, No. 58BH. This was operated nearly three years with a large reduction in drilling costs. At first 6¾ in. bits were used, then a change was made to 7⅞-in., the rated maximum for this model. However, over the years we had become accustomed to the 9-in. hole of the 29-T. No increase in fragmentation due to the more closely spaced smaller holes was evident, and the smaller tonnage per foot of hole tended to offset some of the advantages of rotary drilling. The Joy drill had been so outstandingly successful that some method of drilling a larger hole with it was sought. A 9-in. bit was tried with the Joy, but it was found that the pull-down was not enough for this size. All these considerations resulted in the purchase, in December 1953, of a Bucyrus-Erie 50-R, designed to drill up to a 12¼-in. hole, on which a 9⅞-in. bit is currently being used.

Drill Altered Limestone

The rocks at Calaveras No. 1 Quarry, are the highly metamorphosed, faulted, complex sedimentaries and intrusives characteristic of the Sierra foothills. The limestone, which makes up about 80 percent of production, is really a friable marble.

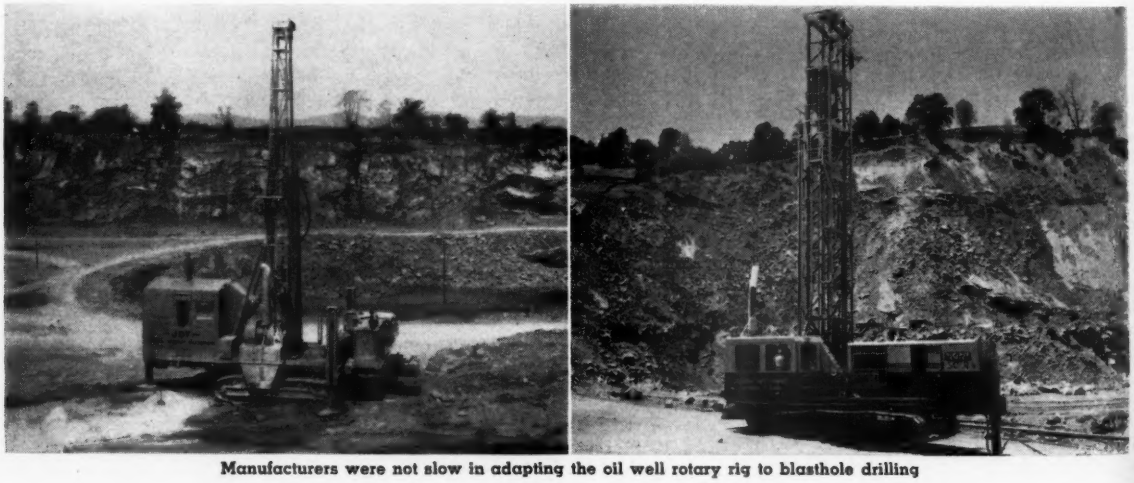
Ready to start drilling with the 50-R

This is cut at all angles by extremely hard, irregular lamprophyre dikes, from an in. or so to several feet in thickness. Surrounding the limestone, and in some places faulted into it, are schists of various types—locally called "shales,"—quartzites and cherts. It is the last two that give the trouble. At times a 29-T can make only one foot per shift in this quartzite, and the Hughes W7R steel bit only four or five. However, the R-1 tricone bit faced with tungsten carbide solves this problem as far as footage is concerned, although naturally at somewhat greater cost than for softer rock.

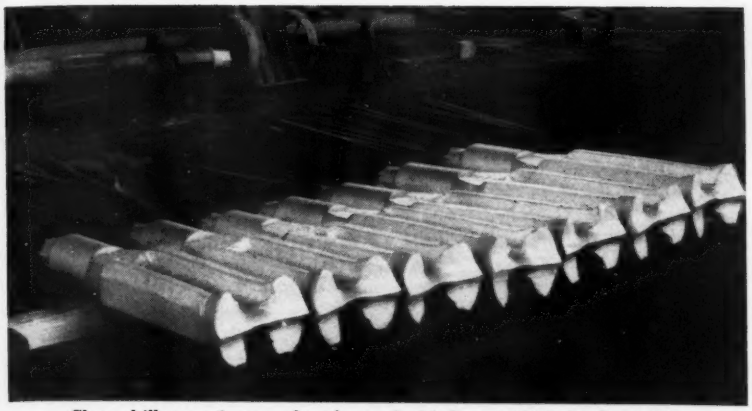
Such complex rocks make it very difficult to log a hole with precision under operating conditions, the best criterion really being the footage that a bit makes. In the accompanying Table II an attempt has been made to classify these rocks into "hard" and "average," with marked differences in footage and cost. Then, for an over-all picture, the two have been combined.

Drills Compared

A comparison of the salient features of the Joy and Bucyrus-Erie may be of interest. Both are mounted on crawlers, both use compressed air as a coolant and chip-remover, separating the cuttings from the air stream by a Roto-Clone. The Joy can be obtained with either electric or diesel drive, whereas the Bucyrus-Erie is made only for electric power. The Joy Calaveras bought was electric powered, and all the figures given are for that model. The Joy uses an ac drive motor, obtaining speed changes from 15 to 80 rpm by a gear-shift. The Bucyrus-Erie uses motor-generator sets and dc drive motors under Ward-Leonard control. Both have "hydraulic" leveling jacks or outriggers, operated by oil. The Joy follows oil-well practice by driving through a square kelly, the pull-down being applied by a chuck that takes a new grip approximately every four ft, with a maximum of 49 in; the Bucyrus-Erie drives through a tapered API joint at the top of round



Manufacturers were not slow in adapting the oil well rotary rig to blasthole drilling



Churn drills sometimes made only one ft of hole per shift in hard quartzite

drill-pipe. On this drill the rotary motor is mounted on a cross-head that starts at the top of the mast and follows the drill-pipe down. It is thus possible to drill 33 ft without interruption. The Joy mast can easily be lowered by hydraulic jacks to pass under power lines or other obstructions; the Bucyrus-Erie mast, when erected, stays up unless dismantled for a major move. For casual moves around the quarry, power lines must thus be high enough to clear. The Bucyrus-Erie has a motor-controlled drill-rack that holds four sections of pipe, any one of which can be moved into position over the hole and screwed tight mechanically, the motors being under control from the operator's seat. It is thus possible for the driller to add a length of drill-pipe by himself, although in practice a helper is advisable throughout the shift.

Outside of these details of design, the principal difference between the two drills is that the Joy is a moderately heavy machine, adapted to drilling up to 7⅞ in. holes in hard rock, and up to 9 in. in softer rock by the addition of a second compressor. The Bucyrus-Erie is a massive, heavy machine designed to drill large holes. The smallest recommended is 9⅞ in. diameter, and the pull-down is rated as adequate for a 12¼ in. hole, although at Calaveras no bit larger than 9⅞ in. has been used. The principal size differences of these two drills are summarized in Table I.

Table II gives performance and costs of the Joy and the Bucyrus-Erie compared to the 29-T churn-drill. It can be seen that the superiority of the rotary drills is very marked. Comparing the performance of the rotaries to the churn-drill, with a production of 10,000 tpd, and using direct costs only, the Joy shows a payout of 281 days and the Bucyrus-Erie 212 days.

Figures on the Joy are an average of more than two years' drilling, and the results should thus be quite reliable. All the rocks drilled are used in these totals, including the hard quartzites and cherts where they were found. Averaged into the totals also are two 9-in. bits that were tried experimentally, and one tungsten carbide bit. These affect the averages very little. About 20 percent of the bits were 6¾ in., used before standardizing on the 7⅞ in.

Data on the Bucyrus-Erie do not cover as long a period of operation, but are the best available at this time. All the breakdowns indicate that they represent the average performance of this drill. Two types of steel bit were tried, the W7R, in which the air passes through central ports, and the W7RJ, in which the air passes through ports on the periphery of the bit. Although the figures show a slight advantage of five cents per foot in favor of the W7R, it is not felt that footage with these two bits is sufficient to give a valid comparison. Further work is necessary to determine definitely which gives the lower cost.

In the hard quartzites and cherts, the superiority of the carbide-faced bit, the R-1, is very marked. It is possible, in extremely tough rock, for a W7R bit to drill as little as two ft before being worn out, whereas low-

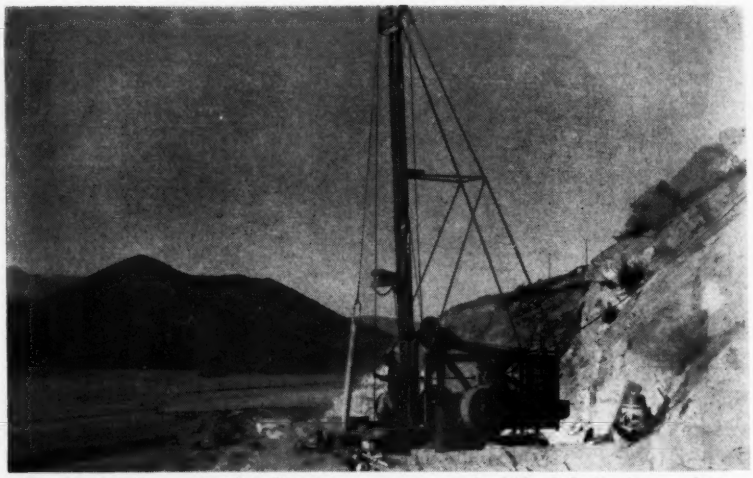
	JOY 58 BH	BUCYRUS-ERIE 50R
WEIGHT	49,000 LBS.	112,000 lbs.
PULL-DOWN	38,000 LBS.	65,000 lbs.
LENGTH	27 FT.	33 FT. - 10 IN.
OUTSIDE WIDTH of CRAWLERS	8 FT.	15 FT. - 9 IN.
WIDTH of CRAWLER TREADS	18 IN.	42 IN.
MAST HEIGHT ABOVE GROUND	37 FT.	54 FT. - 2 IN.
CONNECTED H.P.	185	342½
COMPRESSOR CAPACITY	550 cu. ft. /MIN.	1280 cu. ft /MIN
DRILL PIPE	4 IN. SQUARE	7 - 8⅝ in Round
RATED HOLE DIAMETER	6¼ - 7⅞ IN.	9⅞ - 12¼ in.
COST FOB CALAVERAS QUARRY	$53,490	$105,850
PAY-OUT COMPARED TO 29-T	281 DAYS	212 DAYS

Table I

DRILL	BIT			ROCK	NUMBER OF BITS	NUMBER OF SHIFTS	FEET PER BIT	FEET PER SHIFT	COST PER FOOT				COST PER TON
	TYPE	SIZE	COST						BIT	LABOR	POWER	TOTAL	
29T	CHISEL	9"	$540 (1)	AVERAGE	SEVERAL YEARS OPERATION		1680	17	$0.32	2.12	0.08	2.52	.072
JOY	W7R	6¾ 7⅞	$156	AVERAGE and HARD	274	843	339	110	0.46	0.34	0.15	0.95	.053
50-R	W7R	9⅞	$201	AVERAGE	3	33	1657	151	0.12	0.25	0.20	0.57	.016
"	W7RJ	"	$234	"	5	42	1294	154	0.18	0.25	0.19	0.62	.018
"	W7R	"	$201	HARD	10	14	139	100	1.45	0.38	0.30	2.13	.061
"	R1	"	$227	"	5	47	1082	116	1.13	0.33	0.26	1.72	.049
"	W7R and W7RJ	"	$210	AVERAGE and HARD	18	89	715	145	0.29	0.26	0.21	0.76	.022

(1) INCLUDING SHARPENING

Table II—Drilling performance and costs



The churn drill permitted breaking large tonnage per ft of blasthole but it was slow

est footage for the R-1 is 325 ft; which compares to an average for all carbide bits of 1082 ft.

Two facts stand out, and contribute to the faster payout of the Bucyrus-Erie under our conditions:

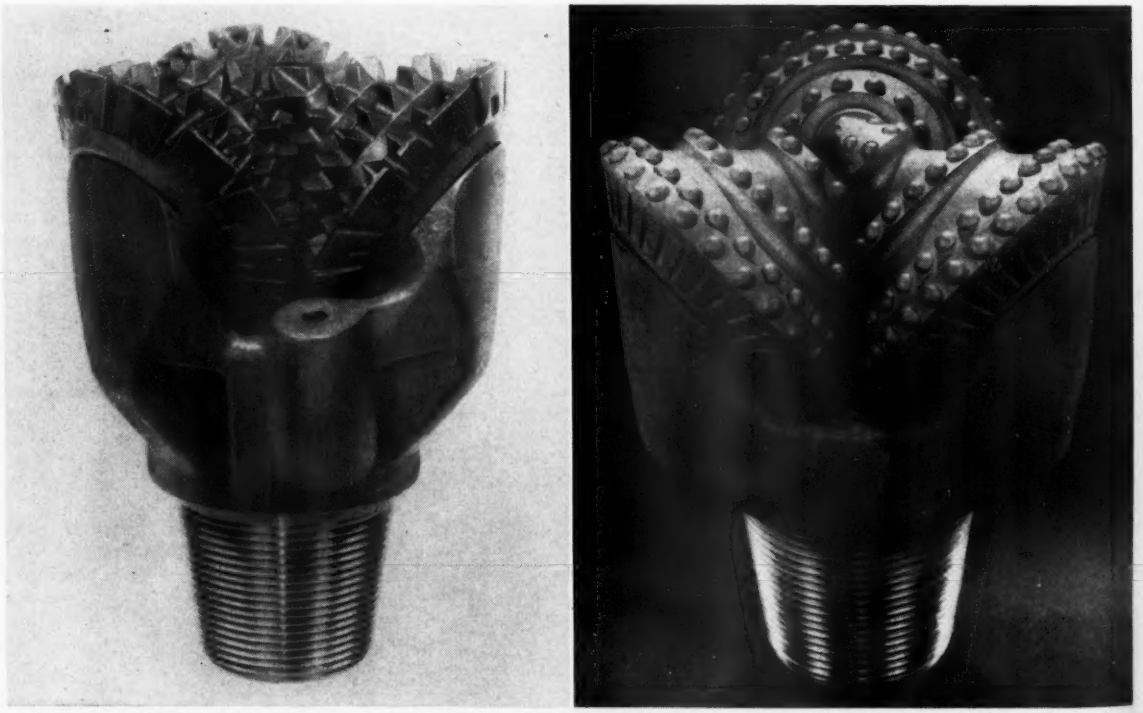
(1) The larger the bit, the greater the footage per bit and per shift. Experience with other operators on this point is the same. The reason is not entirely clear, but it seems to be a basic fact that must be taken into consideration in planning any drilling program with rotary drills. One theory is that the larger bit has more room for bearings, stronger teeth, more "beef" in general. One explanation may be that possibly the larger area gives a more even bearing on the bit, and that the teeth are less subject to uneven wear from local hard spots in the ground.

(2) The 9⅞ in. hole breaks 35 tons per foot of hole compared to 18 tons for the closer spaced 7⅞ in. holes. Fragmentation is not a problem here, and at Calaveras No. 4 Quarry there is no increase in secondary breaking with the larger hole. It is thus possible to space 9⅞ in. holes on 21-ft centers compared to 15 ft for the 7⅞ in. holes. This results in a marked reduction in the cost per ton broken, which is the final result we are all after, and toward which the cost per foot of hole is merely intermediate.

Powder consumption per ton has been checked to see if there is any difference in rotary holes compared to churn-drill holes, but so far none has been evident. Other operators have reported a smaller consumption for the rotary hole, caused presumably by a smoother hole and the tendency of air-blown chips to seal crevices, but this has not yet been observed. Powder consumption remains at 0.8 lb or slightly less per yd for limestone, and 0.7 lb for the silicates, equivalent to 0.33 lb per ton. We use Hercules Gelamite 1 on the bottom and Hercomite X on top, about half and half, stemmed with cuttings from the rotary drill. Primacord is used for fuse, fired from a 440-volt line.

Acknowledgments

Many individuals and companies have supplied details used in this article. Thanks are due particularly to Harvey Livingston of the Bucyrus-Erie Co.; L. C. Rhodes of the Joy Manufacturing Co.; Louis Watts of the Hercules Powder Co.; G. J. Meyer of the Hughes Tool Co.; and J. J. Vetter, L. S. Allsman, Orrin Weeks, Art Collins and Ernest Moffitt of the Calaveras staff.



The Hughes W7R steel bit made four or five ft of hole and R-1 tricone bit with tungsten carbide inserts solved the problem of drilling in quartzite although at somewhat greater cost

The continuous mining machine advances in 25 ft steps

Ventilation and Roof Control With Continuous Mining Machines*

Change in Mining Method Necessitates Change in Mining Plan

By JOHN A. STACHURA
General Superintendent
Enoco Collieries, Inc.

THE Enoco mine of Enoco Collieries, Inc. is located near Vincennes, Ind. Coal is produced from the Indiana No. 5 seam, which ranges from 4½ to 8 ft in thickness. The over-all average is six ft, with an average overburden of 425 ft.

In December, 1953, three Jeffrey Type B Colmols were installed in the mine. These machines with 16-in. arms mine from 50½ to 66 in. in height and 9 ft 8 in. in width. With 18-in. arms they mine from 56½ to 72 in. in height and 10 ft in width.

The Colmol, with a swinging tail conveyor, discharges the coal on the bottom. The coal is then picked up by a Joy 11 BU crawler type loader and discharged into 10 SC shuttle cars. As of June 30, 1954, approximately 160,000 tons of marketable coal have been mined by the Colmols.

Although the practice of forced ventilation is frowned upon by most mining men, the method of mining practiced in Indiana does permit the use of return air traveling over the haulage roads. This practice was used exclusively until just a few years ago. The first major change in ventilation with the installation of continuous miners, and the inclusion of pillar mining in the future program, was to change from forced ventilation to exhaust ventilation.

Ventilation In Entries

Indiana state law requires that openings, or break-throughs be made at intervals not exceeding 45 ft, which is probably the shortest distance required by any state law. Although this is a severe handicap at times, it does simplify the ventilation of working faces.

In main entries permanent stoppings are constructed of 8 by 8 by 16-in. concrete blocks. In room panels the temporary brattices are of wood construction.

In entry development certain working territories are advanced with no problem of gas at the working faces. In other areas extreme care must be exercised as gas begins to accumulate as soon as the cutting head advances a few feet into the solid coal. Here greater precautions than usual must be taken when advancing the working faces. Because of sparks from the many boulders that are encountered in all areas, care must be exercised to prevent any accumulation of an explosive mixture of gas.

A mining plan has been developed to allow the maximum volume and

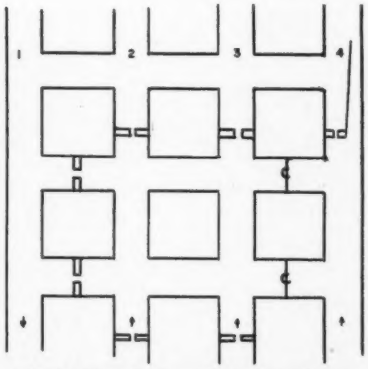


Fig. 1. The above method of ventilation has been devised to allow maximum volume and velocity of air over the miner with a minimum of interruption in the air current

* Based on a paper given before the 44th Annual Convention of the Mine Inspectors' Institute of America, Pittsburgh, Pa., June 28-30, 1954.

velocity of air over the continuous miner with a minimum of interruption in the air current. The intake entry is driven 18 to 20 ft wide to permit sufficient area for good ventilation. A door, 10 ft wide, is installed in the intake entry far enough out-by the last open break-through to permit the continuous miner, the loading machine, and the shuttle car to work at the face with the door closed. Air passes through the opening to the right of the door and is directed to the working face by a line brattice.

Break-throughs are all turned from the intake entry and continued across to hole into the remaining three entries.

Doors are also installed in entries No. 2 and 3, and another door is installed between entries No. 1 and 2 in the second open break-through out by the face. This permits working in the face area without disturbing the line brattice. It has been found necessary to maintain a minimum of 10,000 cfm of air sweeping around the end of the canvas to keep the faces clear, and permit the advance of the machine from 8 to 12 ft into solid coal beyond the last point of advance. Curtains are hung alternately on the left and right side of the entry in which the Colmol is working. This allows the curtain to be hung in the right side of the room if the machine is working on the left lift and on the left side if it is working on the right lift. Thus, air sweeps the entry faces at all times.

The problem of hanging line canvas has been simplified by the use of a spad driver.

Ventilation In Rooms

An entirely new method for ventilating room panels was worked out. With full seam mining, entries had to be developed to provide bleeders around the gob areas. These are connected to the return entry. An overcast then permits pillar recovery with two machines, each on a separate split.

During the development of the room panel, three entries are used for intake and one for return.

When development is completed and room and pillar work begun, the bleeder entries become return airways and the four room panel entries are made intake airways, thereby eliminating all doors.

Test Air At Face

To provide the operator with a simple method for testing the air at the working face, a copper tube was installed on the top and lower section of the cutting head of the Colmol, and extended back to the operator's controls. Aspirator bulbs were placed on the ends of the tubing. To check

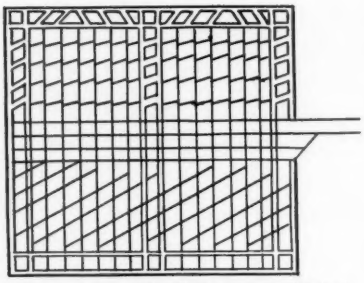


Fig. 2. First, bleeders are established around the block to be mined

the air, the operator draws the air through the aspirator bulbs into his safety lamp. This provides a simple test that can be made frequently. If he detects about two percent of methane on the lamp he stops and clears the face. He then advances again or trams back and resets for a new lift.

Maximum penetration that can be made without tramming back, resetting, and advancing line curtain varies from 8 to 25 ft.

A number of tests have been made with a Mine Safety Appliances Co. Type W-8 Methane Detector to check the accuracy of the mixture coming through the tube against the actual mixture at the face. In every instance, since it was always possible

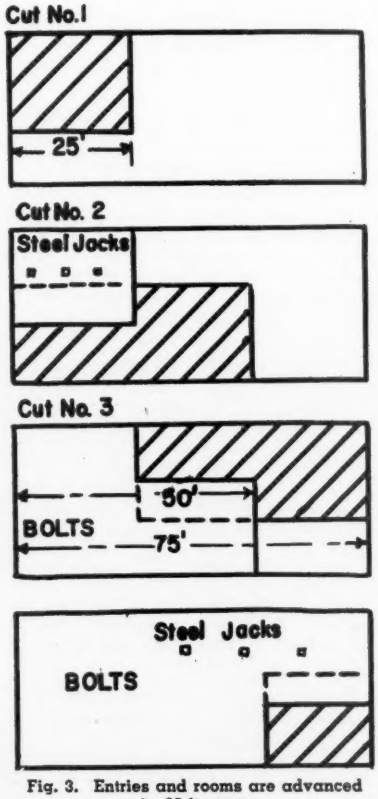


Fig. 3. Entries and rooms are advanced in 25-ft steps

to get a reading nearer the face with the use of the tube than by actually testing the gas at the face with the machine running, a 0.1 percent higher reading was always obtained through the tube.

Permission to use blower fans in conjunction with the Colmols is also being asked from the U. S. Bureau of Mines to provide more velocity at the face.

At the writing of this paper, a methane indicator is being installed on one of the Colmols. The mechanism will be arranged to flash a red light when a mixture containing one percent methane is encountered in the face area. This device will give a continuous check of the presence of methane at the working face.

Roof Control

Roof conditions at the Enoco Mine vary greatly. The east side, which contains about 60 percent of the minable coal, has black slate top with an average thickness of approximately 54 in.; above this is approximately 24 in. of limestone, locally characterized as steel band. Normally this is very good roof. In the southwest section of the mine, the black slate disappears and in some instances the steel band also. This area has a gray or brown shale above the coal and the top is soft and extremely difficult to hold with conventional timbering.

A plan has been adopted for all advance work in entries and for driving solid rooms. The continuous mining machine is advanced a maximum of 25 ft on one side and 50 ft on the other side. The first 25 ft is supported by props or steel jacks on five or six-ft centers. The Colmol is then trammed to the next working place. In all instances the roof is immediately supported by ¾-in. expander type bolts, four ft long. These bolts are installed on four-ft centers as close to the solid face as possible.

Pulling pillars is entirely new to all of our employes. Great care is exercised to get maximum recovery without leaving stumps which are too large. Whenever possible the pillars are mined open end. The roof in the pillar area is supported entirely by props. The continuous miner permits much closer setting of props for roof support than conventional mining. As soon as the machine is sumped into the pillar, props can be set on five or six-ft centers one ft from the machine, providing roof support only 11 ft from the solid coal. Only round props are used in this territory. The operator must exercise care at all times to leave sufficient pillar to guard against unexpected slate falls.

The original mining plan, with reverse shuttle car haulage on the right side, provided for pulling pil-

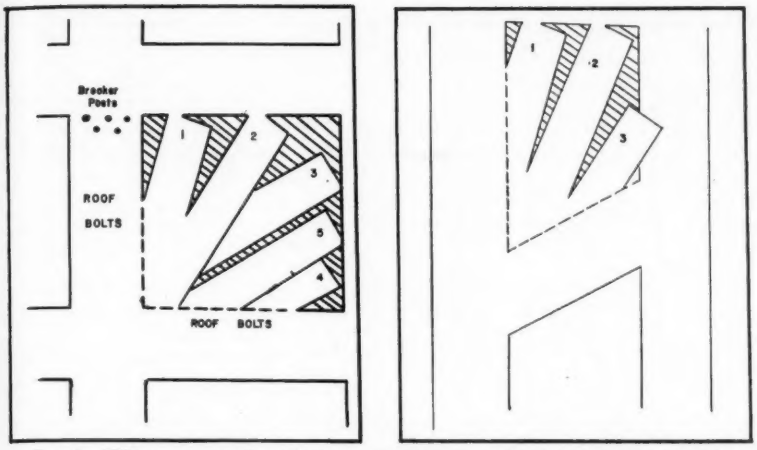


Fig. 4. Whenever possible pillars, are mined open end. Great care is taken to get maximum recovery without leaving stumps which are too large

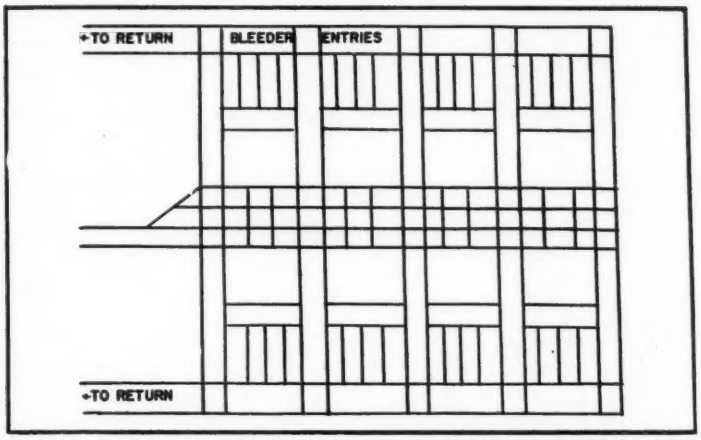


Fig. 5. By driving an extra set of entries on each side of the panel to split the room pillars, inefficiencies caused by longer haulage, difficulties with cable, and tramming of the mining machines were eliminated

lars in each room from left to right, making a flat pillar line. This did simplify the recovery of entry pillars, since it eliminated the point between two gob areas. However, due to inefficiencies created by longer haulage, difficulties with cables, tramming of Colmol, etc., an alternate plan is now being tried. This plan will require more careful timbering only in final robbing of entry pillars.

This alternate plan, illustrated by Fig. 5, eliminates the inefficiencies mentioned before and allows the driving of solid places closer to the gob area. This permits the machine to advance more rapidly due to greater benefit of pressure from the overburden. This plan also reduces the area of roof exposed between the solid coal and the gob area, thereby giving greater protection to the Colmol operator at all times with a minimum of timbering.

Summary

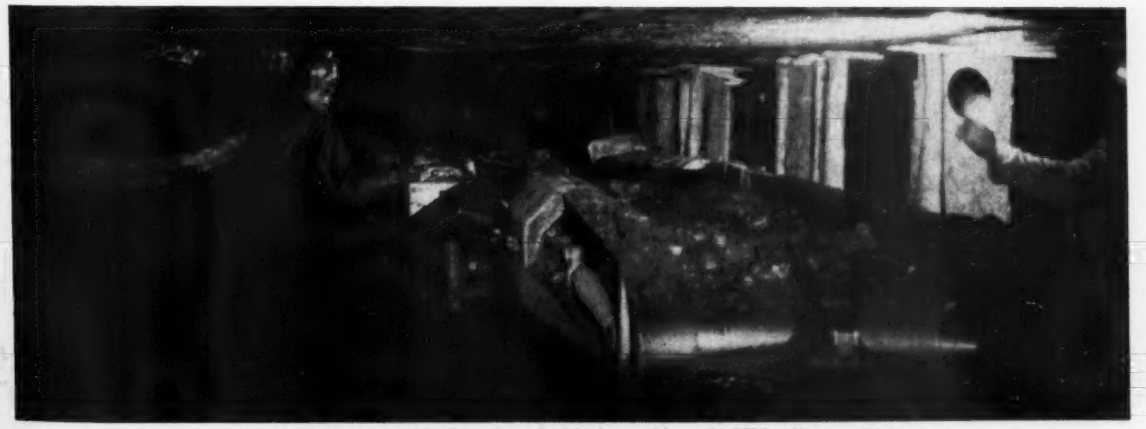
After seven months of experience with the Jeffrey Colmols, mine management finds that ventilating areas that do not produce much methane can be handled very much the same as conventional mining, with little or no curtain. However, areas that produce larger quantities of gas require much closer supervision with continuous miners. This problem can be eliminated by some type of booster fan to supplement the line curtain. This can be accomplished and still have a low methane reading in the return airway. Without the aid of booster fans, even with good line curtain one can have a low reading in the return airway and still have one percent or more methane detected at the cutting head of the continuous miner.

To insure maximum protection against roof falls, it has been found necessary to do roof bolting in all solid working places.

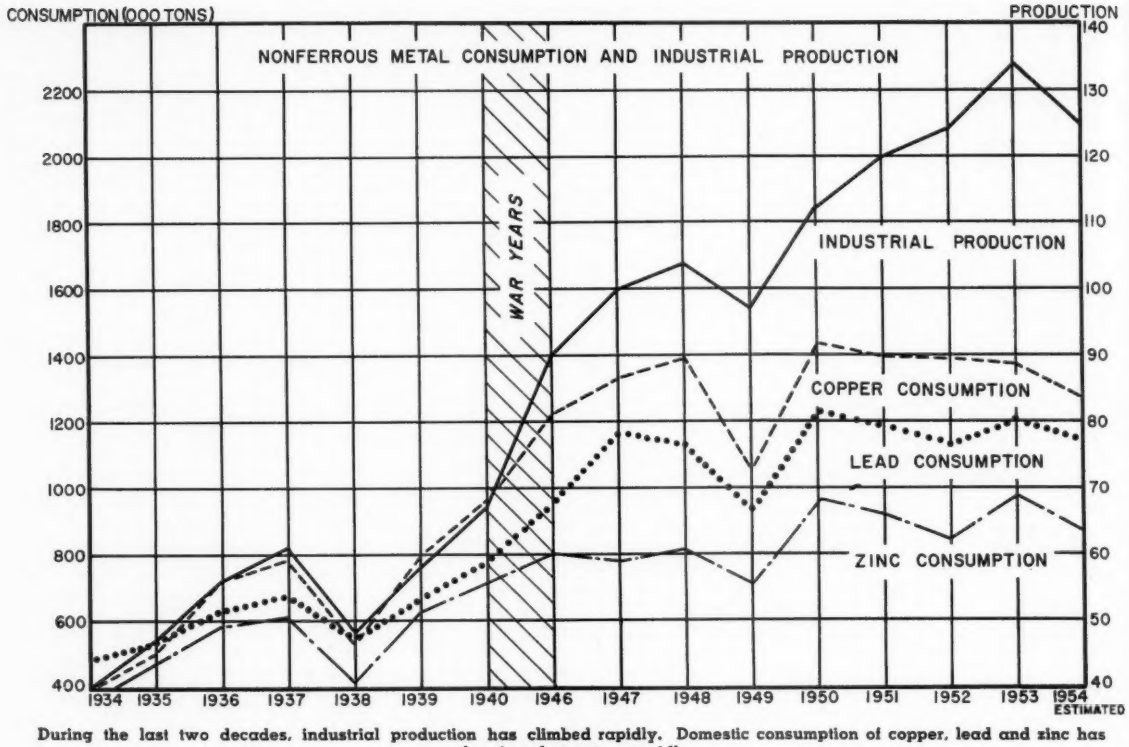
In pillar work the setting of props on five- or six-ft centers has proven very satisfactory. To date, pillar work is simplified greatly when done with continuous miners as compared to conventional mining.

Since the gob area is always within one or two rooms of a large solid block of coal and each room is pillared as soon as it is developed, the time element reduces the roof problems greatly.

Continuous mining, through better roof control, makes possible much greater coal recovery.



Coal is discharged to the bottom and picked up with an 11 BU loading machine



During the last two decades, industrial production has climbed rapidly. Domestic consumption of copper, lead and zinc has also risen but not so rapidly

Outlook for the Non-Ferrous Metals

By SIMON D. STRAUSS
Vice-President
American Smelting and Refining Co.

Stockpiling and Other Aids Will Have Only Temporary Effect. Copper, Lead and Zinc Must Meet Competition to Prosper

SINCE 1947 industrial production of the country has increased between 25 and 30 percent, as measured by the Federal Reserve Board Index. In the same period consumption of copper and lead in the United States has declined slightly and consumption of zinc has increased by a very modest amount.

In the past we have tended to think of consumption of these basic metals as varying directly with industrial activity. The sharp divergence in the trend between over-all industrial activity and the use of the non-ferrous metals in the last seven years, therefore, is disturbing.

With an expanding population, with the rapid development of science and of production techniques, and with the enormous accumulated savings of the public as background, most economists agree that this country faces a period of further industrial growth and of still higher standards of living for its people. But will the non-ferrous metals share in this improvement?

Coal, Butter and Potatoes

It cannot be taken for granted that they will. Other industries which in the past were considered of equal basic importance have not participated in recent economic expansion. Coal is an outstanding example. Butter is another. And just the other day in the press a government official was quoted as decrying the fact that consumption of potatoes, on a per capita basis, has fallen every year for the last fifty. Our grandfathers gorged themselves on an average of 160 lb of spuds a year, whereas today we make do with only 100 lb.

In the case of coal, butter and potatoes, the reasons that caused them to fall behind in the industrial parade are fairly clear. The discovery and rapid development of petroleum resources, both here and abroad, created a major economic competitor for coal. The steadily rising level of wages hurt the high-labor-factor coal industry far more than it did the oil producer. The consequence has been that coal has been priced out of much of its market.

The case history of butter is not too dissimilar from that of coal. Vegetable margarines provide an acceptable and cheaper substitute for butter. Government stockpiling has helped the dairy farmer get a good price for his product, but the price has been such that it has accentuated the swing to margarine. The butter goes in the stockpile and the margarine goes on the table.

As for potatoes, technological obso-

lescence seems to account for a good share of their relative decline in importance on the dinner table. People have learned to get food energy from other sources which they consider less provocative of expanding waist lines. In recent years also, the potato farmer has looked to the government for help through price supports and stockpiling; he has received this assistance, but it has not helped him to sell potatoes to the public.

Is there an ominous parallel between coal, butter and potatoes on the one hand, and copper, lead and zinc on the other? Is the relationship of aluminum to the older non-ferrous metals the same as that of oil to coal or of margarine to butter? Is stockpiling of metals likely to result in shrinking or static sales to consumers just as stockpiling of butter by the government has been paralleled by a drop in sales to consumers?

INDUSTRIAL PRODUCTION AND METAL CONSUMPTION IN THE UNITED STATES

	Industrial Production	*Copper Consumption (000 Tons)*	*Lead Consumption (000 Tons)*	*Slab Zinc Consumption (000 Tons)*
1934	40	397	488	360
1935	47	508	539	473
1936	56	721	634	582
1937	61	785	679	610
1938	48	527	546	421
1939	58	793	667	626
1940	67	960	782	719
1946	90	1231	956	801
1947	100	1338	1172	786
1948	104	1394	1134	818
1949	97	1053	958	712
1950	112	1438	1238	967
1951	120	1395	1185	934
1952	124	1391	1131	853
1953	134	1376	1202	978
1954 Est	125	1275	1140	864

Sources:
Industrial Production: Federal Reserve Board Index.
Copper Consumption: U. S. Copper Ass'n, Consumption by Fabricators.
Lead Consumption: 1934-40, A. B. M. S.; 1946-54, U. S. B. M.
Zinc Consumption: 1934-40, A. B. M. S.; 1946-54, U. S. B. M.

Balance the Equation

These questions deserve hard and serious thought by the mining industry. It would be foolish indeed to jump hastily to the conclusion that the period of expanding use of the non-ferrous metals is ending; but it would be equally foolish for this industry to believe that stockpiling or higher tariffs or subsidies are the answer to all its problems.

Here are some factors that merit consideration on both sides of the equation:

(1) One cannot expect that consumption of copper, lead and zinc would in any case rise as much as over-all industrial activity. Much of the new economic growth of the country is in such fields as electronics and aviation, which are enormous users of man-hours but small users of raw materials. The Paley Commission report, to which many mining men took exception in respect to particular items, estimated that by 1975 gross national product might have doubled as compared with 1950, but raw material demand, over-all, would increase only between 50 and 60 percent. The same commission estimated the increases for copper, lead and zinc during the same period at 43 percent for copper, 78 percent for lead and 39 percent for zinc. Even if these particular estimates are open to question the principle of a slower rate of growth for raw materials is clear. Consequently, one should not consider that the metals are falling by the wayside if their use does not increase quite so rapidly as over-all economic activity. But obviously, consumption should show some increase if the industry is to maintain a healthy economic position.

(2) One factor that has hurt copper, lead and zinc has been the relatively inelastic capacity of these industries. U. S. capacity to produce aluminum was doubled in three years (1951 to 1954) in response to the Korean crisis. A corresponding increase in copper, lead and zinc would have been virtually impossible in the same period of time, no matter what economic incentives were offered to the producers. The reason for the greater speed in expanding aluminum is that bauxite reserves are high-grade, easily mined, fairly abundant, and account for only a small part of the over-all cost of producing aluminum. To expand aluminum output is a question of providing power and processing facilities. With copper, lead and zinc, expansion is only possible when new ore deposits have been found. Relatively few commercial deposits are lying unexploited and available for quick development in the event of an emergency. The new ones require extensive and expensive preparation and equipment.

(3) The fact that additional supplies of copper, lead and zinc cannot be made available as rapidly has led to a pronounced tendency on the part of planners of military equipment and supplies to design away from the base metals and into aluminum or steel. And once a military requirement has been established and additional aluminum or steel capacity has been built to meet it, then the expanded supply hangs over the market in peacetime. The intelligent and aggressive drive for markets made by the aluminum producers has been premised on the promise to consumers that ample aluminum will be available. Consumers are less certain of base-metal supply. Copper has lost ground to aluminum in the fields of electrical conductors and hardware, zinc is faced with aluminum competition in die-casting and galvanized sheets, and lead is now threatened with aluminum applications for cable coverings.

(4) A further factor which has tended to encourage the substitution of aluminum for the base metals is the relative price stability of aluminum. The limited number of producers and the relatively low labor factor in its cost of production are the two principal reasons why the aluminum industry has been able to avoid frequent

Demand for base metals varies widely but supply tends to remain constant

price changes. There are some who feel that the base metals should adopt a similar policy. Desirable as this may seem, the very nature of the industry makes it impractical. The large number of producing entities, many of which are not directly sellers, prevents rapid curtailment of production when demand drops. Unit costs mount sharply on declining volumes, so the average mine continues to produce at full capacity until receding prices caused by surplus stocks force some to close. In other words, demand for base metals varies considerably but supply tends to remain constant—the inevitable result is wide swings in price.

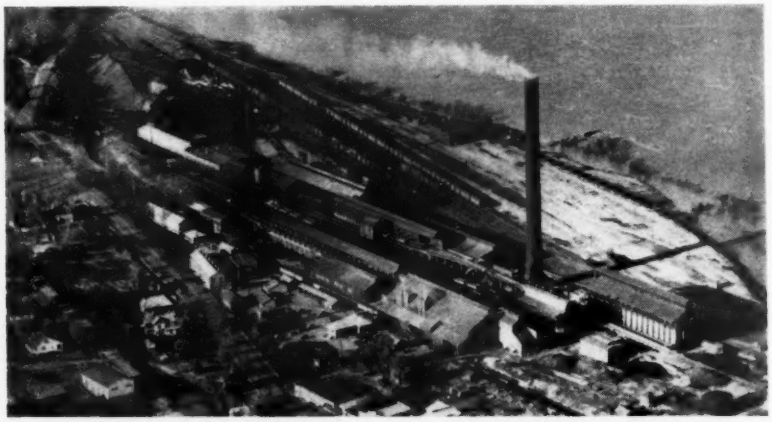
(5) Prices do have an effect on the volume of consumption, but the effect is a delayed one. Each time the price of lead or zinc was reduced during 1952 and early 1953, one heard the sage remark that "They won't sell any more metal at the lower price than they would have at the old one." This is undoubtedly true over a short period of time—say six months or so. But over a long period of time, price has a most important bearing on the volume of consumption. I am personally convinced, for example, that if copper stays at 30 cents a lb for an indefinite period of time its use will be considerably lower than it would be if its average price in the future were to be 24 cents a lb. Whether demand at 30 cents will still be large enough to absorb the available supply is another question; the point is simply that price does affect demand eventually—when consumers are convinced that it is going to stay high or stay low, as the case may be. To offer a simple illustration, I refer again to the wide scale substitution of fuel oil for coal as a source of power and of heat. The relatively high price of coal caused this; the temporary dip in coal prices that occurs in slack seasons is not enough to reverse the trend.

(6) To say that low prices are caused by the dumping here of metal produced abroad, therefore, is an oversimplification of a complex problem. Prices of lead and zinc are lower today than they were at the time of the Korean war in part because the demand for these two metals was adversely affected by their high prices at that time. A tariff wall might protect the domestic miners from foreign competitors; it would not protect him from aluminum or other substitute materials. And if, by virtue of a tariff wall to keep out imports, the United States price is maintained at a level that causes a reduction in overall demand, then even the domestic mine production may eventually be in excess supply.

Effects of Stockpiling

(7) The President within the last forty days has decided that for the present at least the problems of the lead and zinc industry can best be met by accelerated stockpile buying—at the rate of 200,000 tons of lead and 300,000 tons of zinc of domestic origin a year. These figures are roughly two-thirds of the current rate of mine production and about half the 1951-1952 rate of domestic mine production. Even with the large stocks of zinc overhanging the market when the program began, its effect promises to be to move prices upward. In fact, the initial announcement of stockpile buying in March was primarily responsible for the market strength in the prices of these two metals during the spring. For the short term this may be a solution to the industry's economic problems. But unless the government is to go on buying for stockpile forever, the industry must have more consumer demand to remain in a healthy economic status.

(8) As the government stockpiles of base metals grow, the incentive to design away from base metals for military purposes should lessen. Large stockpiles should give the services a feeling of security as to supplies of these metals and they should therefore plan on using the material most suited to a particular purpose rather than simply the material most likely to be available. This, in turn, may mean that perhaps if there is another Korea-type emergency, the government will be less prone to finance expansion of aluminum capacity simply because it can be done more easily and more quickly than an expansion of copper or lead or zinc capacity. The base metals can have no quarrel with the growth of the aluminum industry, if it is based on normal economic and technical development. But to have a competitive material financed on an excessive scale by government funds for wartime purposes can create serious peacetime problems.



Plant expansion in nonferrous industry is a relatively slow process

Meet Competition to Prosper

To summarize, it would be nice to be able to say to you that the outlook for copper, lead and zinc is rosy. I do believe the over-all business outlook for the country as a whole is good. But the three base metals have not been sharing in the increase in general business activity to the extent they should. If this situation is to be corrected, if they are to enjoy their normal share of expanded trade, the producers of these metals must be prepared to offer their wares at an economic price in relation to competitive materials and the fabricators and manufacturers who convert the metals into finished products must have reasonable assurance of future supplies comparable with the assurance they now feel about, for instance, aluminum.

Such assurance is not increased by over-emphasis on the mining industry's economic problems nor by excessive reliance on government assistance —whether it be tariffs, stockpiling, subsidy schemes, import quotas, or allocations. Instead of scaring consumers by repeated newspaper publicity on these problems, the base-metal industry can win friends and influence demand by calling attention to the proven merit of its products, by stressing the development of its technology (which in recent years has added millions of tons of metal to known reserves through new and improved methods of discovery and production), and by concentrating on finding ways to make use of copper, lead and zinc both easier and cheaper. If demand is increased, what now seems to be excess capacity will be readily absorbed and the industry will prosper.

Maintenance of Electrical Cap Lamps

Proper Care Pays Off in Longer Life and Improved Service

Today's electric cap lamp provides more than 100 times the light of Edison's first model of forty years ago

BECAUSE of the development of electric cap lamps, electric lighting is as firmly established in the mining industry the world over as in other industries where light is supplied from stationary fixtures. Thus, the introduction of the miner's battery cap lamps early in the 20th century had in its way as great an effect on mining as did the introduction of the Davey Safety lamp a century earlier. The first commercial cap lamp was developed in 1914 by Thomas A. Edison and approved for use underground by the U. S. Bureau of Mines in early 1915. Improvements in design have been steadily made so that now much greater illumination is available to the miner than was possible before the introduction of electric cap lamps.

More light and more dependable lamps proved to be a means of improving the safety and efficiency of miners and mining methods. Work interruptions, formerly caused by lamp failures or need for adjustment, were practically eliminated. Maintenance has been greatly simplified through the years by improvements in equipment design, charging circuits, and lamp room arrangement.

There are two general types of cap lamps available to the mining industry. One uses a nickel-iron-alkaline battery and the other a lead-acid battery. This article is directed to the user of the nickel-iron-alkaline type lamp.

The cells which made up the battery of the lamp Mr. Edison designed are the type known as nickel-iron-alkaline. In its simplest form the cell is made up of a nickel oxide positive plate, a metallic iron negative plate and an alkaline electrolyte. This article is devoted to the maintenance of lamps using the Edison or nickel-iron-alkaline type cell.

Money in Maintenance

Like any other important tool, electric cap lamps require routine care and maintenance to keep them at highest operating efficiency. Such maintenance is comprised simply of daily battery charging operations, periodic watering and cleaning. These three necessary operations provide a simple and efficient means of maintaining a continual check on the condition of each lamp, including such points as light output, minor accidental damage, worn cord, or need for bulb replacement. This is preventive maintenance, a profitable procedure in mining operations as in all industries. Loss of lighting efficiency through neglect of maintenance can be tolerated no more than can a dull edge on a cutting tool.

Important in the maintenance of cap lamps is the lamp house. This should be a fireproof structure with ample room for charging racks and electrical control panels, for performing the routine maintenance operations, and for distribution of lamps. It should be well ventilated, well lighted, and kept clean at all times. A lamp room temperature of not less than 50° F. should be maintained. Batteries will temporarily lose capacity and give a shorter burning time if allowed to stand in lower temperatures. Running water and compressed air are desirable and a steam jet is ideal for cleaning the batteries, although a brush and water pan are adequate for that purpose. Ample bench space and an enclosed storage space for supplies is recommended, and a still for producing distilled water is usually necessary.

Battery Charging

The simplest electrical circuits are normally used for charging batteries, and charging equipment providing varying degrees of automatic operation may be selected. The charging current flowing into the lamp batteries may be provided from either d-c or a-c lines, and an independent power source is usually better than the mine d-c trolley circuit. The d-c mine trolley circuit may be a stand-by source of power, however, in the event of temporary failure of the regular charging power source.

Either motor generator sets or rectifier units are in common use to convert alternating to direct current for battery charging. Rectifier units are of two types: one employs tubes, the other selenium discs for rectifying. Of the two, the selenium disc type is preferred because of its longer useful life. A motor-generator set is one of the most dependable sources of charging current. Common d-c voltages are 125, 250, and 375 v. Power capacity should allow one kw for each 240 cells.

The number of cells connected in series for charging is determined by

Illustrations and article, courtesy Mine Safety Appliances Co.

the available voltage. When the d-c voltage is 125, for example, one shelf of 60 cells connected in series constitutes a circuit; and two shelves of 60 cells each can be put in a 250-v circuit.

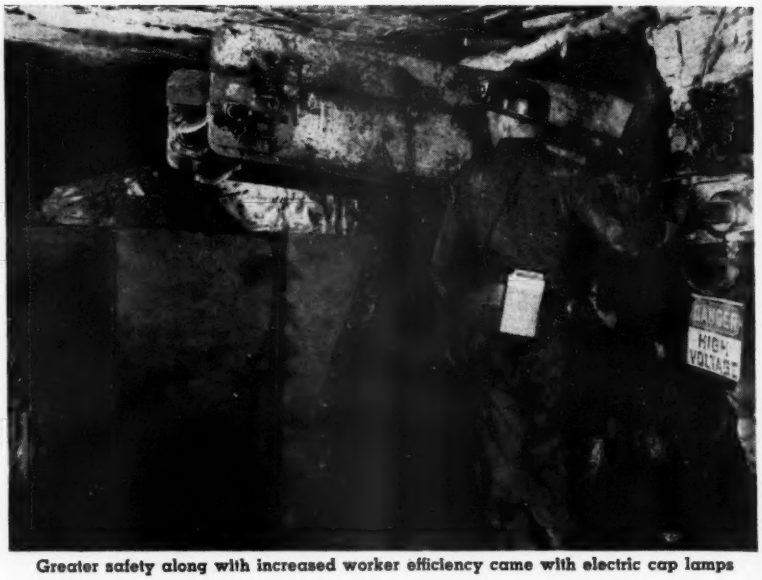
Addition of a timer to the battery charging control panel for opening the circuit assures the proper amount of charge without further supervision after putting batteries on charge. Panels should be identified with their circuit and rack shelves by numbers.

Assign Responsibility

Proper servicing facilities and "assigned responsibility" can solve every problem of miner's lamp servicing or maintenance. Under these conditions there is no real reason for tolerating less than maximum performance of lamps at all times.

The useful life of any type lamp battery depends primarily upon how well it is serviced. The importance of proper procedure is demonstrated by differences in the life records of batteries. For this reason the details of battery maintenance procedure are specified for maximum efficiency and economy. This means the right charging current for the right length of time, addition of water when needed, and cleaning.

Principal maintenance duties, for the daily re-charging of batteries, are commonly performed in three ways. Since the placement of the lamps on the charging racks is simple, miners at the end of a shift on their way to the changeroom can pass by the magnetic unlocking fixture, open the cover and then each man can place his lamp in its assigned space on the charging racks. At the beginning of the next shift the miner simply withdraws his assigned lamp from its place, snaps the cover in place, and the lamp is ready for use. This is called a "self-service" system.



Greater safety along with increased worker efficiency came with electric cap lamps

In the "standard service" system, lamps are turned in and handed out by a lamp house attendant over a counter. A "modified self-service" system permits men to pick up and replace lamps in easily accessible assigned compartments other than the charging rack.

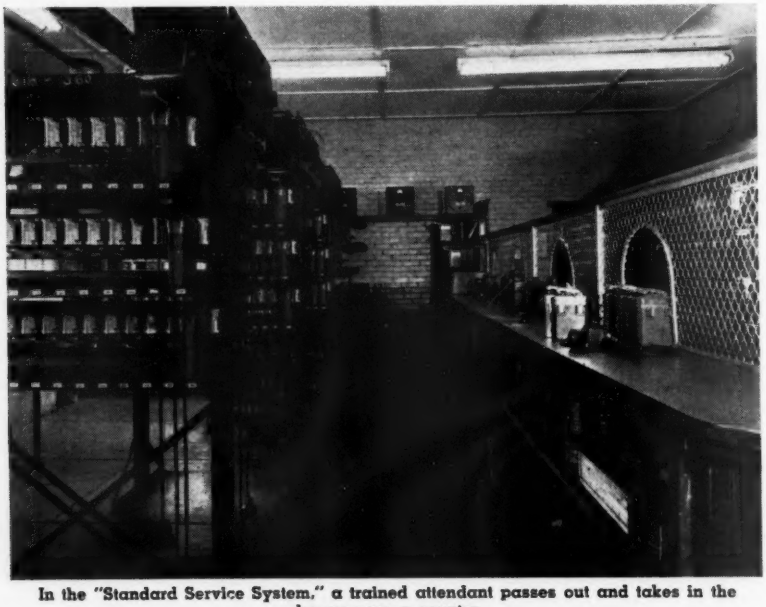
Regardless of the system employed, mine operators who assign responsibility for lamp care to certain individuals, and have efficient lamp rooms, get the best lamp performance. Daily supervision of the lamp room by an assigned employe, either part time or full time, assures efficiency in lamp handling and maintenance.

Responsible inspection, proper recharging, regular periodic watering, and cleanliness are the only essential protective measures to maintain top performance of these valuable miners' tools. They serve also as an incentive to each miner to give his lamp the kind of care that will assure years of efficient lighting service.

Both lamps and racks should be numbered and a check system used to assure that each miner gets the same lamp every day. This is also an incentive for proper care of lamps by miners. It has another advantage in making the lamp rack a quick indicator of who is in the mine.

Individual care by miners can and should be improved further by asking each lamp user to take certain precautions. The following are suggested as a minimum:

1. Treat your lamp as the valuable tool that it is. This assures you trouble-free service and the most light. Your safety may depend on your lamp.
2. Do not use the cord as a handle.
3. Do not drop the head piece or drag it on the floor.
4. Keep the light turned on at all times.
5. Report a burned-out filament at the end of the shift.
6. Put a loop in the cord to indicate any difficulty with your lamp when leaving it in the rack when no attendant is on duty.
7. Never open the headpiece.



In the "Standard Service System," a trained attendant passes out and takes in the lamps over a counter

Charging

Lamp batteries should always be charged at the rate of 1.8 amp for ⅔ of the burning time. For example,

when lamps are burned for nine hours, the charging period should be six hours. A charging rate lower than 1.8 amp will tend to cause the battery to produce less than normal voltage with consequent reduction in light output. This will assure that all batteries will receive a uniform cycle of charge and discharge.

Charged lamps that are idle or used as spares and are permitted to stand in the rack should be pulled off the charging clips and turned on to burn a normal shift. Batteries that operate shorter than normal periods of charge and discharge become sluggish because they are under-worked. For general welfare of all lamps it is good practice to completely discharge all lamps once a month and then recharge for 12 hours at the 1.8 amp rate.

Lamps not in regular service should be discharged and recharged once each week or taken from the rack, discharged, properly filled with water, short circuited and stored in a cool, dry place. Those permitted to stand charged for a day or two should be recharged for two hours before being placed in service.

If a time clock is used to control charging, it should be set to assure shut-down at the proper time. Although overcharging does not harm a nickel-iron-alkaline battery if the solution is kept above the plates, it causes abnormal evaporation of water which must be replaced. Undercharging must be avoided in order to assure adequate light output throughout the following work shift.

Watering

When lamps are used every day, it is necessary to add distilled water once each week to a level ½ in. above the battery plates. Electrolyte should never be used instead of water to restore solution level.

Watering is a semi-automatic operation when using an automatic filling device that is provided for this purpose. It assures that each cell is filled only to its proper level above the plates by stopping the water flow at this point. The automatic filler is a necessary accessory in every lamp house for both watering and renewing and removing solution because it not only assures proper filling but also minimizes filling time.

In preparation for watering, the lamps are taken from the rack and lined up on a table or counter. Since the covers are open, it is only necessary then to use a screwdriver to remove the valve block, by about two turns on a screw that remains integral with the block after loosening. Valve blocks should be placed in a pan of distilled water during the watering operation, to clean and dissolve the carbonates. Warm water acts more satisfactorily than cold.

Battery watering is semi-automatic with a filling device. Use nothing but distilled water

Changes in Electrolyte

During discharge of the battery, the positive active material (a nickel oxide) is reduced to a lower oxide and the negative material (metallic iron) is oxidized to form an iron oxide. The reverse is true when the battery is charged. The reactions do not appreciably change the density of the electrolyte (potassium hydroxide) which may be said to act simply as a conductor of oxygen. Normal specific gravity of the electrolyte is 1.220. Depending on the working time, the specific gravity will gradually decline to 1.160 when it should be dumped out and replaced. If the time required for dilution to 1.160 is less than nine months, it is an indication of overcharging, spillage or both.

A hydrometer is needed to determine specific gravity of the electrolyte. A standard hydrometer is available that will allow drawing test samples directly from the cell. If this type is not on hand, electrolyte can be poured into a clean glass container and tested with a large barrel hydrometer.

True readings can only be made when the solution is thoroughly mixed after charging, is at a proper level over the plates, and at a temperature of 60°F. Corrections for temperature can be made by adding 2½ points (0.0025) for each 10° above 60° F and subtracting the same for each 10° below 60° F to the observed reading.

Hydrometers that have been used for taking gravity readings of acid batteries must not be used to test the electrolyte.

Renewal of electrolyte requires (1) battery discharge to zero voltage, (2) removal of the valve block as previously described, and (3) emptying the cells by inverting and shaking. After these three steps the cells are refilled with renewal electrolyte in the same manner as when adding distilled water, using the automatic filler. Each lamp takes about 5½ oz of electrolyte.

Lamps that have been out of service during a prolonged shut-down, but not prepared for storage as described earlier can be put back in condition for service again as follows:

(1) Clean the outside of the batteries
(2) Renew soft rubber parts if they have deteriorated
(3) Water batteries and allow them to stand for several hours
(4) Empty the electrolyte and refill with renewal solution

In a "Modified Self-Service System," the miner picks up and replaces his lamp in easily accessible compartments other than the charging rack

In a "Self-Service System" the miner takes his assigned lamp from the charging rack and replaces it at the shift's end

(5) Charge at 1.8 amperes for 12 hours
(6) Discharge through bulb in headpiece
(7) Recharge for 12 hours
(8) Clean headpiece contacts and tighten all fittings

Check the Small Things

To assure a good electrical contact at the bulb, the base contacts on the bulb should be brightened by rubbing across a piece of cloth before using them to replace burned-out bulbs. The reflector in the headpiece is made of a special grade of aluminum with its surface treated to provide maximum brilliant light output. Any marring of the finish will cause a loss of light. If the reflector becomes dirty it can be washed with soap and water, then rinsed in clear water.

It should go without saying, of course, that any piece of equipment operates best if it is maintained adequately. This is true of cap lamps also. The limited preventive maintenance regularly required to obtain effective lamp performance is essentially:

(1) Charge adequately
(2) Use distilled water
(3) Replace burned out bulb or broken lens.

If a lamp starts to "blink," the trouble can usually be traced to one of the following:

(1) Corroded or dirty contacts on bulb or switch barrel
(2) Bulb not down tight or not turned into correct position in socket
(3) Low electrolyte level
(4) Partial short circuit in the cable

If a lamp fails or becomes dim during the shift, the cause may be traced by checking the following points—not necessarily in the order given:

(1) Electrolyte level in cells
(2) Gravity of electrolyte
(3) Check switch and bulb contacts for corrosion and proper tension
(4) Check cord for broken connections or short circuit
(5) Inspect rack charging clips for broken connections and proper contacts

If the battery fails to hold its charge, has become sluggish, or is being put back into service after an extended idle period, it should first be checked for the five points listed immediately above. The following procedure should then be followed:

(1) Discharge the battery to zero through the headpiece
(2) Charge for 12 hours at 1.8 amp
(3) Again burn down to zero through the headpiece. If the lamp burns for at least 8½ hours, recharge for 12 hours and place in normal service
(4) If the lamp fails to burn for at least 8½ hours repeat steps 2 and 3 once more
(5) If it still fails to burn the required time, put a momentary short across the poles and check the voltage of each cell immediately after the short is removed. A cell not showing at least one volt should be replaced with another cell known to be in good condition

Tools and Parts

Tools required in better maintenance are simple. They include screwdriver, pliers and a set of wrenches. The only special tools are the magnetic lock opener and a bulb extractor. Vinegar should be kept on hand to neutralize the effects of the alkaline electrolyte. Although this soluion is a preservative of steel, it does require some precaution in handling. Since it will irritate the skin in time if not washed off, lamp attendants are advised to wear rubber gloves and goggles when handling it.

Testing equipment includes a hydrometer for determining the specific gravity of the electrolyte, a d-c voltmeter for periodically checking charge and discharge voltage of individual batteries and an accurate test ammeter.

An inventory of replacement parts is recommended to assure about six months of operation. For a 100-lamp installation this should include 100 lamp bulbs, five cables, 25 lens, five reflectors, five switch barrels, five bezels, and one nylon battery container. This provides for all normal breakages and bulb burnouts. For the charging equipment the only parts requiring replacement are the fuses.

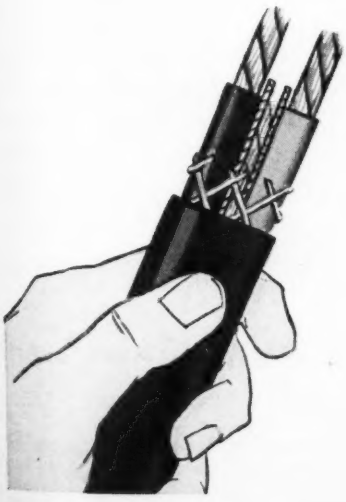
The maintenance program for miners cap lamps is one of vital importance to the mine operator because *LIGHT* is his number one tool for most efficient operation—without it no equipment can be operated. A simple, but well planned program of preventive maintenance consisting of fixed responsibility in the lamp house, plus continued interest and service from the supplier of the equipment, will assure unfailing, dependable light for the miner.

"Tell me...how can we stop overloads from cooking our cable?"

"We can't always control overloads on our shuttle car cable. But the damage it does has got to be stopped. It raises blisters . . . which makes our cable easy to tear. And you know . . . because of that heat the jacket on the bottom layer of cable on the reel hardens and cracks. That raises hob with cable life! What can we do?"

"You'll put a stop to the trouble if you do this..."

"One of the most important things is to choose a cable with adequate current rating. Your cable or mining machine manufacturer can help you here. You can help avoid trouble *in the mine*, too. When you remove cable for permanent splicing . . . reverse the ends. And when you are working only a short distance from the power source, remove your cable from the reel and place it where it will be well ventilated. Finally, remember that you generally get what you pay for — one breakdown in a cheap cable costs you *more* than you save by buying on price."



New AnacondA Cables last longer and are safer!

In 15 mines recently surveyed, ANACONDA Cables on shuttle cars are lasting up to 300% longer than cables used only a few years ago. Why? Anaconda cable jackets are made of a new neoprene formula which assures better protection against hard wear. Improved cold rubber insulation has high heat stamina. An improved stranding flexes better under tension. And a new type breaker strip insures better short-circuit protection. It all adds up to *real economy* in use. See your Anaconda Sales Office or distributor. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.* 54399

the right cable for the job

ANACONDA®

WIRE AND CABLE

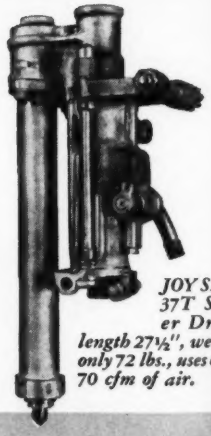
What's YOUR roof-bolting method?

HAMMER DRILLS or . . .

YOU'RE AHEAD Either Way

Pneumatic Hammer Drills If you are bolting in hard-structure roof, the Joy SAL-37T Stoper Drill with constant-pressure Telescopic Feed has advantages that no other drill of its type can match. (1) The long steel changes it affords (up to 42") result in *one-third* fewer steel *changes* for your roof-bolters to make; also fewer steel sizes to carry in stock and haul to the face. (2) Air consumption is reduced about 33⅓%, yet (3) at no sacrifice in drilling speed compared to heavier drills using up to 50% more air. (4) Weight is reduced 30%, improving the ease of handling in low or high seams. (5) Maintenance is low; the SAL-37T was developed expressly for heavy duty roof-bolting service—it stays on the job!

Other superior Joy features include: cadmium-plating inside and out for rust-protection and easier run-in; centralized controls with push-button release for easy operation; and independent feed control (no need to crack the throttle to position the drill). Any way you look at it, the Joy SAL-37T means more hole footage per shift in hard roof, drilled in less time and at less cost. ● *Ask for a demonstration—let us prove it.*

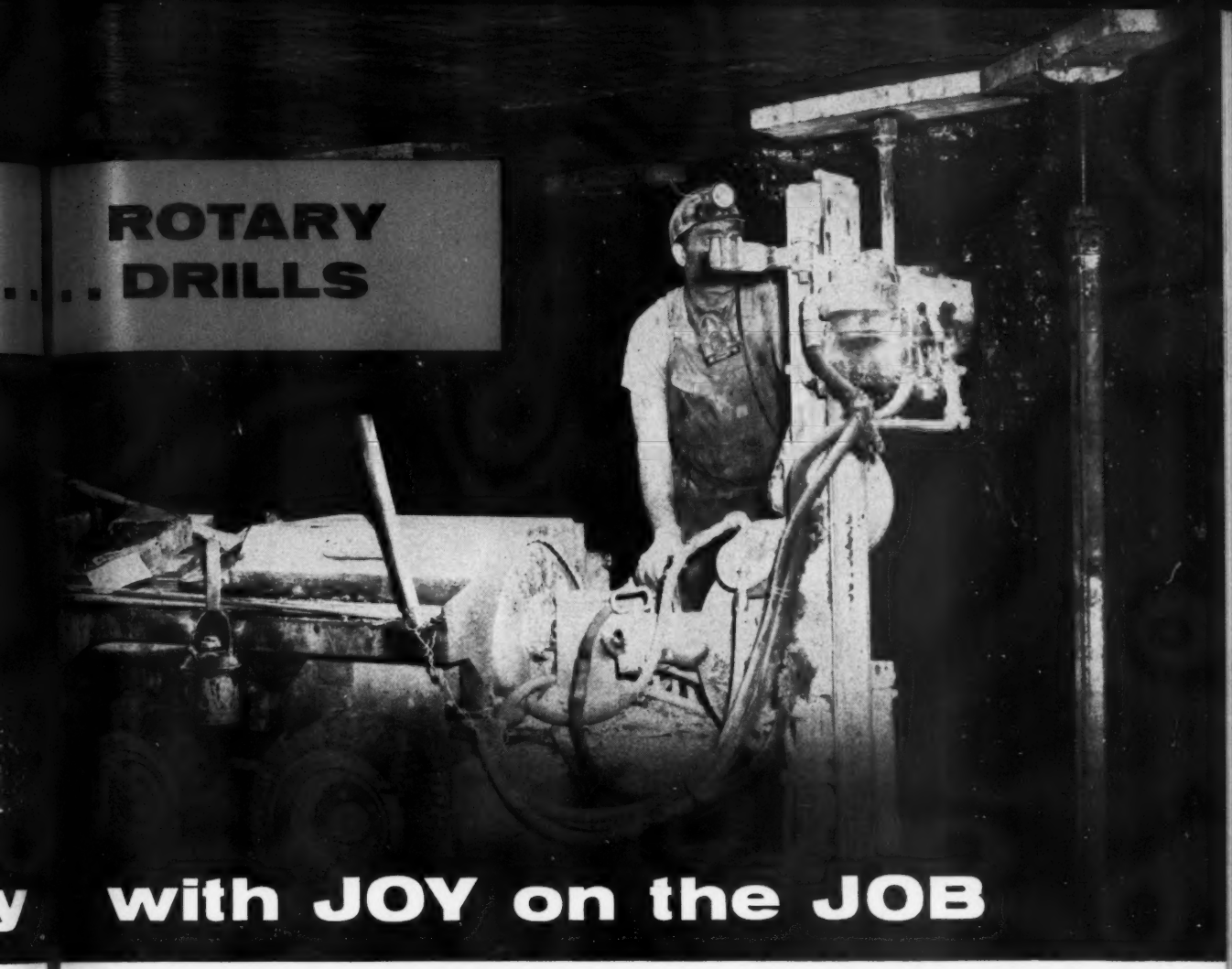


JOY SAL-37T Stoper Drill, length 27½", weighs only 72 lbs., uses only 70 cfm of air.

JOY SERVICE . . .

a Plus Value with Either Drill

Joy sales and service branches and warehouses are conveniently located for immediate availability in every mining area. Joy men are at your side in a matter of hours, when needed, to service your drills—help train your mine personnel to run, maintain and repair the equipment—and help to secure and install Genuine Joy Replacement Parts from nearby stocks, on overnight delivery if necessary. Always use Genuine Joy Parts, made to the original specifications for materials and precision fit.



with JOY on the JOB

Hydraulic Rotary Drill For roof-bolting in softer sandstones, shale or slate, where hydraulic rotary drilling can be employed to advantage, you'll find the Joy RBD-15 away out in front.

Chief features of this self-contained, self-propelled rubber-tired unit are its high maneuverability, great drilling power, and unequalled flexibility in operation. The RBD-15 trams up to 107 fpm, and individually controlled pairs of wheels on each side permit it to turn in its own length, handle as readily in tight places as a crawler-mounted unit, and position holes quickly and accurately.

No other rotary drill is as versatile. With just the touch of centralized hydraulic controls (no time lost; nothing to adjust) the RBD-15 offers an infinitely variable combination of thrust, feed speed, rotation speed and torque to suit variations in the roof structure and the changing needs of the job: from drilling the holes to setting the bolts and tightening the nuts.

Feed thrusts can be varied up to 5400 psi; feed speeds up to 18 fpm, with "run-up" and retraction speeds up to 60 fpm; and there are two rotating speed ranges: a high speed of 700 rpm max., with a max. torque of 115 ft. lbs.—and a low speed of 360 rpm max., with a powerful torque of 240 ft. lbs. max.

Hydraulic boom roll and easy manual drill tilt permit drilling at an angle, also compensate for uneven bottom and assure steel changes without moving the machine. Most holes can be bottomed with only one steel change, or less.

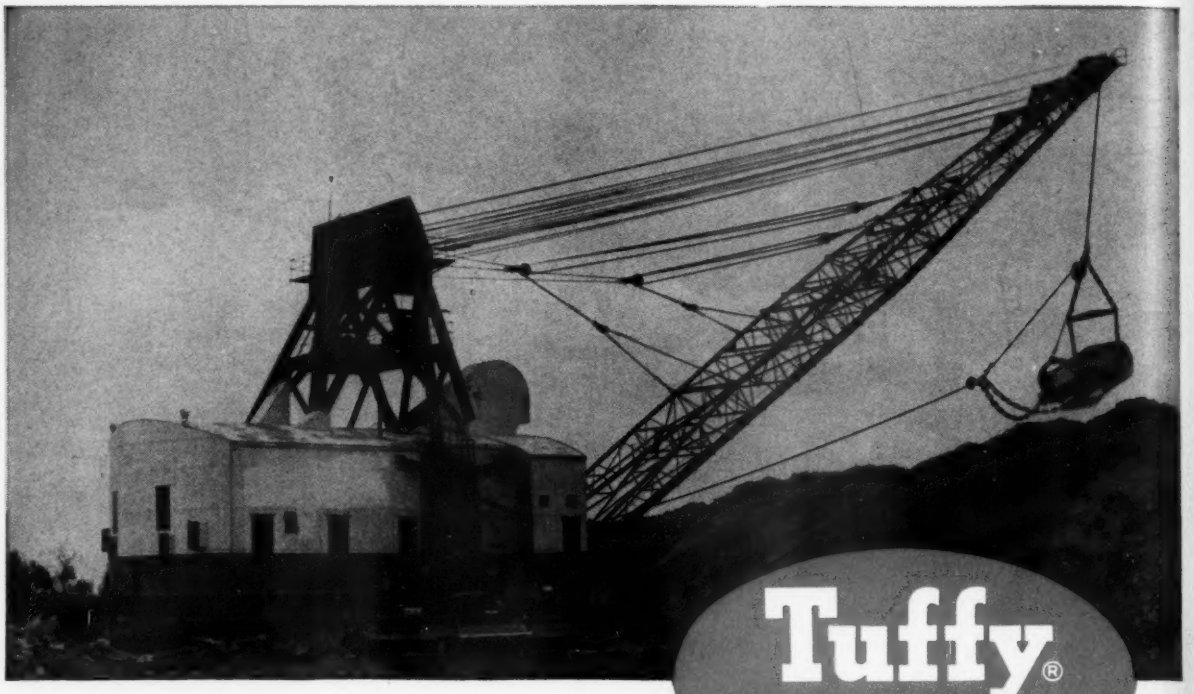
Check with us for the roof-bolting equipment, rotary or pneumatic, that will do the best job under *your* conditions. To determine them accurately, a new service—*Joy Rock-Testing Service*—is at your command. Ask about it. **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

The Joy RBD-15 Hydraulic Rotary Drill, 42" wide, available in two models: 33" and 37" high, with feed frames ranging from 36" to 90" to drill seams from 42" to 96" high.

Consult a Joy Engineer

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT



Tuffy® DRAGLINES

Hitch Your Drag Buckets to For Bonus Loads-Fewer Replacements

Tuffy Dozer Rope Designed to take the punishment of small winch drums and small sheaves . . . the shock of blade manipulation under toughest going! Mount a 150 ft. reel—avoid wasting rope.

Tuffy Scraper Rope Flexible enough to withstand sharp bends . . . stiff enough to resist looping and kinking when slack . . . tough enough to resist drum crushing!

You need not "baby" a Tuffy Dragline when you hit tough terrain. The strength is there to pull it on in and come up with a bonus load almost every time you cast.

And, too, Tuffy Dragline is so constructed with larger wires on the outer lays as to present more surface area of tough steel to stand abrasion longer.

But there is even more to the combination which lets you come out with fewer dragline replacements. The inner structure of Tuffy Dragline is engineered to contribute greatly to the overall strength and at the same time maintain the flexibility needed in casting the bucket.

Your Union Wire Rope distributor can supply you with these longer running draglines for every digging purpose without complicated specifications. Simply order Tuffy Draglines. That plus the diameter and length writes the strongest dragline specifications possible.

Tuffy Slings
9-part, machine braided wire fabric construction is extra flexible, extra strong . . . knots or kinks are readily taken out without material damage.

Tuffy Slusher Rope
A unique 3 strand non-collapsing wire rope fortified against drum crushing, abrasion and shock loads.

union UNION WIRE ROPE CORP. *Wire Rope* **corporation**

2144 Manchester Avenue Kansas City 26, Mo.

Specialists In High Carbon Wire, Wire Rope and Braided Wire Fabric

"Me Switch? ...Never!"

"OK! SO I AM PIG-HEADED! I gave up trying other ropes years ago. It pays me to standardize on Roebling. Why? Well, with Roebling I get exactly the type of rope I need, when and where I need it . . . no makeshifts . . . no delays . . . and the performance is tops."

* * *

Why not find out for yourself? Call your nearest Roebling office or distributor for a Field Man. He'll recommend the ropes that perform and stand up best in the mines. And you'll learn what service really means!

ROEBLING

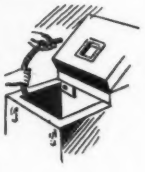
Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J.

BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

Cold Test

Exposure to sub-Arctic temperature is one of the ordeals these cables must undergo to prove their qualifications. The cables are conditioned for one week at –70° F. and, while at this temperature, bent around a mandrel having a diameter three times that of the cable for cables .55" and less in diameter. Larger cables are bent to greater diameters. This is one of the most severe ways of testing U. S. Royals.



U. S. ROYAL CABLES ARE COLD RESISTANT

7 reasons why U. S. Royal Cables mean safety:

Seven grueling laboratory tests, each of them tougher than actual conditions, guarantee U. S. Royal's resistance to moisture, abrasion, cutting, heat, cold, impact, flexing. United States Rubber engineers spare no effort in making sure U. S. Royal is a completely safe electrical cable. Write for your free copy of valuable booklet on mining cables to address below.

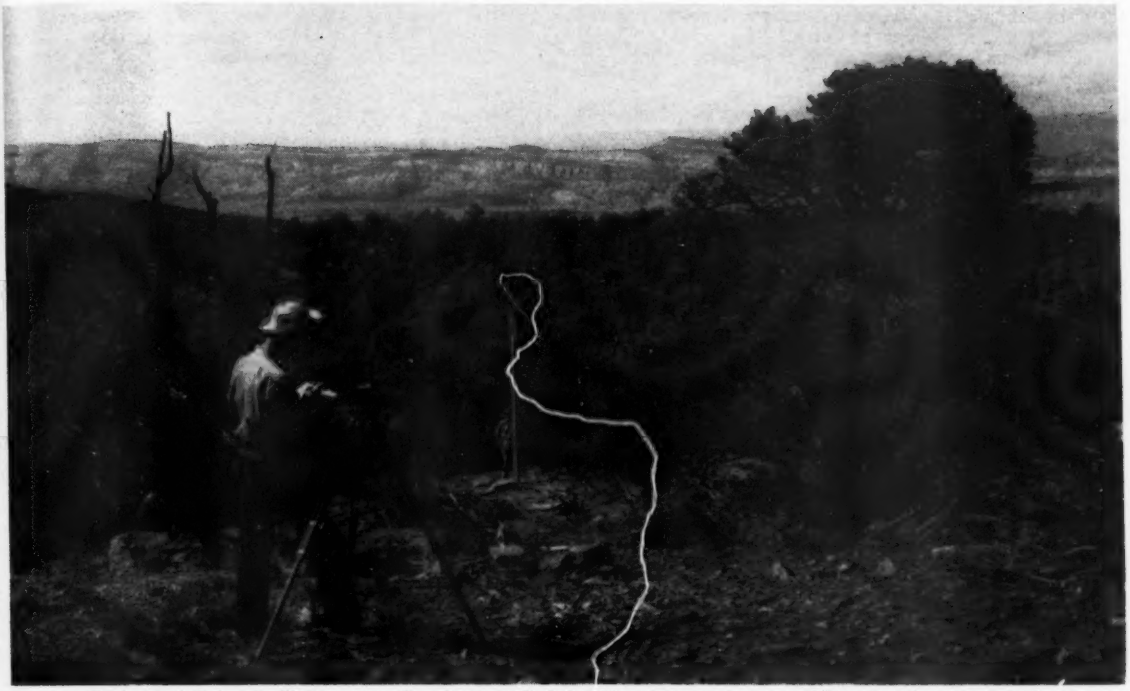
SAFETY TESTED

U. S. Royal Shielded Portable Cable Type SH-D

US RUBBER

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE AND CABLE DEPARTMENT • ROCKEFELLER CENTER, NEW YORK 20, NEW YORK



Geology of Colorado Plateau area has been studied for 60 years—yet many problems remain unanswered.

Structural Controls of Uranium Deposits

Often Neglected in Geologic Studies of Colorado Plateau Area, Structure Played Primary Role in Ore Deposition

By E. V. REINHARDT
Hunt Oil Co.

THE mining of uranium ores on the Colorado Plateau is not a new industry. The first discoveries were made in 1895 and soon after 1900 mining was started and actively pursued until 1921 when production of better grade ores from the Belgian Congo began to supply the world's demand for radium at less cost than from the Plateau. During the 1930's, as the clouds of World War II began to gather over Europe, the old radium mines were reopened for their vanadium content. This period lasted until 1944 or 1945 and was followed by three years of inactivity. In 1948, the U. S. Government began to buy the ores for their uranium content and in 1951 a substantial increase in price was announced, resulting in the "boom" which those who live in the Plateau country are experiencing at present.

So the study of the geology of the deposits of the Plateau is not new. It has been going on for nearly 60 years, but many problems remain unanswered and are not likely to be solved quickly nor with finality.

The author feels that the most detrimental feature of earlier studies was the early conceived and often-repeated thesis that the ores were formed simultaneously with the sediments. That this cannot be true is obvious from the radical manner in which they cut across the bedding planes of the sediments. The idea, however, has been so widely disseminated and its adherents have clung to it so tenaciously that the structural features of the Plateau and their relation to ore deposition have been sadly neglected on the grounds that the ores were deposited before the structures were formed and that the structures could, therefore, have had no influence on their formation. To many now working in the area, this point of view is fallacious and harmful to the development of the industry. It is intended to demonstrate here that the primary controls of the Plateau deposits are structural while the sedimentary controls are secondary.

Ore Horizons Constant

The stratigraphy of the Plateau should not properly be included in a discussion of the structure. Some allusion to the stratigraphy, however, is unavoidable. For those who are unfamiliar with the stratigraphic column, the accompanying chart has been prepared. Uranium minerals have been found in every formation in the Plateau. About 98 per cent of the ore production, however, has come from the horizon of the Jurassic Salt Wash member of the Morrison formation and the horizon of the Triassic Shinarump conglomerate. Most of the ore in the Salt Wash horizon is in the Salt Wash itself but in those areas where the Salt Wash is thin or absent, the ore

may be found in the Recapture, Todilto, Westwater, upper Entrada, or basal Brushy Basin. Yet, it remains always within a vertical interval seldom exceeding 200 feet below the base of the Brushy Basin shales! Similarly, the ore in the Shinarump horizon may, in the absence of the Shinarump, be found in the base of the Chinle shales, in the Moenkopi or in the upper portions of the Cutler but remaining always in a vertical interval extending from the Chinle shales downward for 200 feet.

The third formation which appears now to contain substantial quantities of uranium in minable bodies is the Dripping Springs Quartzite member of the Apache series of Pre-cambrian age. Here again, the ore occurs below a soft, relatively impermeable, shaley formation known as the Mescal limestone.

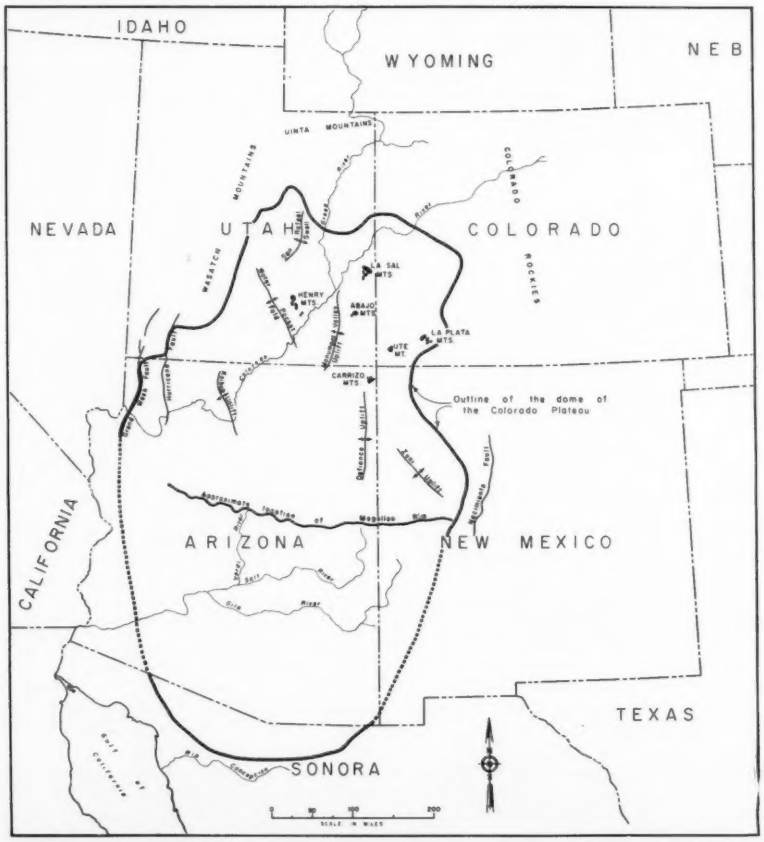
Is it not significant that the two outstanding ore-bearing formations are capped by the two thickest and most plastic shale members in the Plateau and that the third, promising formation is capped by a plastic shaley limestone? It is almost axiomatic that a favorable horizon in which to seek ores formed from rising hot solutions is the first permeable stratum beneath a relatively impervious cap. It seems impossible to attribute such a constant relation between ore horizons and capping shale members to chance.

Structures of First Order

Geologic structures of the Plateau fall naturally into four categories based upon their size and prominence.

Structures of the First Order: The first feature is so large that its presence has escaped many students of the area. It is the huge, structural dome of the Colorado Plateau itself. In the central, more elevated portions of the dome, Paleozoic and early Mesozoic strata predominate and around the periphery are found the Cretaceous and Tertiary sediments. The closing rim of younger sediments lies against the western flank of the Colorado Rocky Mountains on the east, the southern flank of the Uintah Mountains on the north and the Wasatch Mountains on the west. On its southern side, the Plateau itself ends at the Mogollon Rim but the dome-structure continues southward. At the Mogollon Rim, the Paleozoic formations rise to heights attained in few places in the northern part of the Plateau, indicating that the structure, instead of terminating, is reaching upward to new heights, unknown farther north. The Mogollon Rim marks only the northern limit of the erosion basin of the Salt, Verdi and Gila Rivers. A reconnaissance study of southern Arizona failed to find the black shales common to the middle Cretaceous. The search was continued into Sonora. There, they were found along the northern side of the Valley of the Concepcion River, extending in an arc across the Sierra Madre, passing just south of Cananea and turning northeast into western New Mexico. We can thus outline one of the world's major dome-structures extending from north to south a distance of 800 miles from northern Utah to Northern Sonora and from east to west, distances varying from 200 to 400 miles.

A significant deduction may be made from these observations. When the dome was arched in early Tertiary time, a void was not left beneath it. As quickly as space was created, it was invaded by molten magmas. By implication, therefore, the Plateau is underlain at varying depths by a Tertiary batholith, largely unexposed by erosion but manifested locally by small intrusive bodies. In view of the presence of this single, large, buried batholith, it is quite normal to consider the widely spread uranium-vanadium deposits to be of hydrothermal origin.



Structure of the First Order is so large its significance has escaped many students of the area.

Structures of the Second Order

Let us proceed to structures of the Second Order. Superimposed upon and complicating the great dome of the Plateau there are numerous smaller domes. They vary in length from 50 to 100 miles, have their long axes from north to northwest and have no exposed intrusive igneous cores, although many of them contain numerous dikes and volcanic plugs. They undoubtedly represent stocks or high points in the roof of the underlying batholith. Their long axes are shown on the map. They are known as the Waterpocket fold, the San Rafael Swell, the Monument Valley Uplift, the Defiance Uplift, the Zuni Uplift and the Kaibab Uplift.

A second group of structures of the same order of size as the domes are several mountain masses, roughly circular in outline with exposed igneous cores. There are six of these, known as the La Sal, Abajo, Henry, Carrizo, La Plata and Ute Mountains. Multiple stocks form their cores, but their flanks are formed by large sills from which their geologic name of laccolithic mountains derives. The diorites and monzonites exposed in them were viscous and not excessively hot when intruded, as indicated by the thin bands of metamorphic material at the contacts. It is unlikely that the ore-bearing solutions came from the mountains but rather that the igneous

Careful study of aerial photographs and ore zones in operating mines yields data which can be used to recommend drilling programs removed from the rims.

matter in the mountains and the solutions came from the same magma chamber.

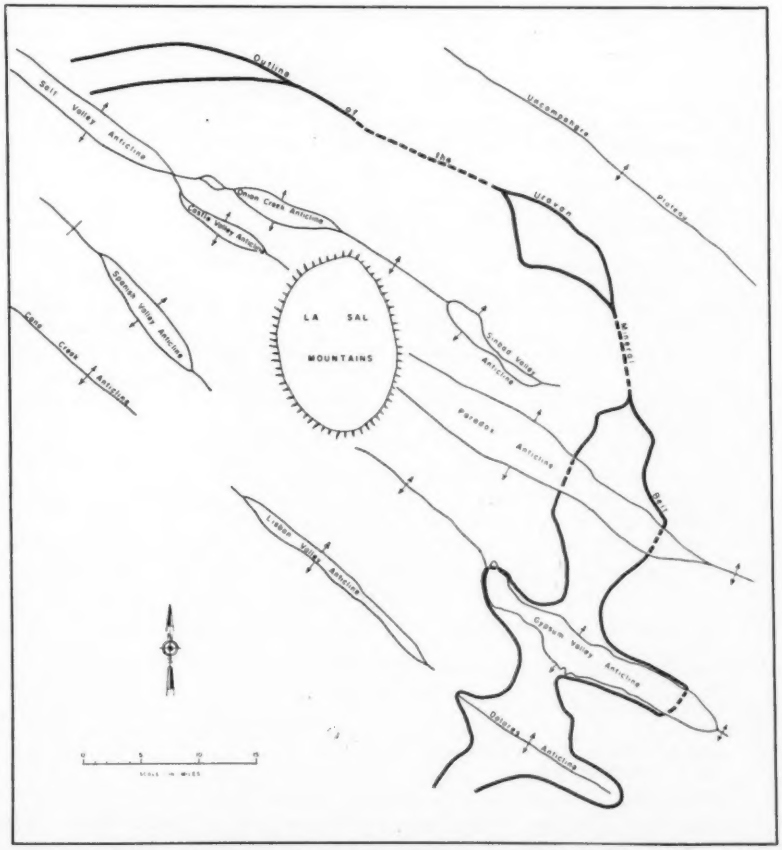
Structures of the Third Order

Structures of the third order are anticlines, much narrower than the domes and usually shorter, although one of them is 140 miles long. Several of them lie end to end in segments separated by a few miles of faulted but unfolded strata so that the individual parts are on the order of 12 to 18 miles long but the over-all length of the structures is as much as 70 or 80 miles. These anticlines are closely spaced, rather gentle folds in the vicinity of the La Sal Mountains and lie with their long axes trending northwest. On the southern and southwestern side of the mountains, they are known from northeast to southwest as the Uncompahgre Plateau and the Paradox, Gypsum, Dolores and Lisbon Valley Anticlines, and on the northern and northeastern sides as the Sinbad, Castle Valley, Salt Valley, Spanish Valley and Cane Creek Anticlines.

With the exception of the Uncompahgre Plateau, these structures have had similar histories which are worth relating briefly. From a small inland sea, somewhat larger than Great Salt Lake, several hundred feet of salt, gypsum and black shale were laid down in early Pennsylvania time. At the end of the period of salt deposition, a compressive force acting along a northeast-southwest line folded the existing beds into the same pattern we see today and raised them out of the water. Thereafter, throughout the Permian, Triassic and Jurassic periods, the beds did not sink below the sea, except for one or two brief intervals. The general terrain, however, although sinking, was filling in as fast as it sank with wind-blown and stream borne sands and silts which were heavier than the plastic salt whereon they rested. Because of the plastic nature of the lightweight salt, it rose along the flanks of the old Pennsylvanian anticlines, almost as fast as the sediments were being deposited in the intervening basins. Therefore, along the crests of the anticlines, a normal Permian, Triassic, lower Jurassic column between 2000 and 3000 ft thick is pinched to only a few hundred feet. In middle Jurassic time, the salt ceased to rise, probably because it had all been squeezed from the sides allowing the hard upper Pennsylvanian to rest on the hard Mississippian below. From middle Jurassic time onward, the sediments were deposited uniformly over the anticlines. In Tertiary time, renewed lateral compressive forces again folded all of the sediments along the same lines preestablished in the Pennsylvanian. Later some of the crests of the anticline collapsed, forming grabens filled with blocks measured in hundreds of feet in width, by miles in length. These blocks are bounded by faults patterned by the first compressive movement in Pennsylvanian time and accentuated in the Tertiary.

Stuctures of the Fourth Order

Structures of the fourth order are fractures including both faults and joints. The most prominent faults of the Plateau strike northwest and coincide with the salt anticlines. Some of them have had vertical displacements



Strong ore concentrations are often found at intersections of Third Order Anticlines and Uravan mineral belt, and only weak concentrations in the synclines.

in excess of 1000 ft. Also, large north-south faults bound portions of the great dome of the Plateau on its eastern and western sides. There are a few northeasterly striking faults of lesser displacement throughout the Plateau and most of the large domes with northerly striking axes have a few northerly faults on their flanks.

Jointing throughout the Plateau has been extreme. In places, there is a single system of joints; elsewhere there are conjugate systems cutting the sandstones into squares and diamonds. Here, the joints are straight, there curved. In some places the joints are widely spaced and elsewhere they are clustered closely together. Although jointing is universal throughout the Plateau, the most pronounced systems are on the crests and upper flanks of the domes and anticlines.

The last feature of the structure is the rolls in the ore bodies. These are the planes along which the ore cuts across the beds of the sedimentary strata. There are several varieties of rolls. Some, shaped like the letter U, mark the boundary of the mineralized material surrounding a fossil tree or other carbonaceous core. Others are shaped, in cross-section, like the letter S. This type of roll controls the long axes of the ore bodies, particularly in the Salt Wash deposits. In any given area most of the rolls are oriented in the same direction and frequently lie in clusters. Often they lie parallel to the prevailing strongest fracture system of the area. The vertical displacement from the upper wing of the S varies to the lower wing from a few in. to as much as 20 ft and the length, which is often proportional to the height, varies from four ft to a maximum of 1200 ft observed at the Oliver Mine in Gypsum Valley.

Many geologists deny that the S-shaped rolls are fractures. Their regular orientation and their confinement to elongated belts, indicates that the cross-cutting vertical portion of the S has a joint control, largely obliterated by mineralization, and the upper and lower wings or bottom and top of the S are controlled by bedding planes cut by the joints.

Relation of Ore Deposits To Structure

Now let us observe these structures again from large to small, noting the relation of the ore deposits to them.

Relation of the ore deposits to structures of the First Order: Roughly 90 percent of the known uranium deposits of the United States are located on the elevated portions of the dome of the Colorado Plateau, including the deeply eroded portion in Southern Arizona.

Relation of ore deposits to structures of the Second Order: Speaking of the structures of the second order, all the known large cap deposits related to the domes have been found on their crests or upper flanks. No large bodies of ore have been found in the basins intervening between them.

The ore occurrences in the Salt Wash surrounding the laccolithic mountains on the other hand, are quite different from those on the domes. Exposures of Salt Wash are larger and more frequent in the vicinity of the La Sal Mountains than elsewhere. Here it has been quite fully demonstrated that a mineralized belt, varying in width from 0 to 10 miles, surrounds the mountains at distances ranging from 12 to 18 miles from the igneous contact of the core of the mountains. It has been named the Uravan Mineral Belt by Fischer and Hilpert of the U. S. Geological Survey. Most of the large deposits in the Salt Wash lie within this belt, but there are several substantial deposits located from four to eight miles from the igneous contacts. Outside the outer belt at distances further removed from the mountains, a few mineralized spots have been found but no substantial ore bodies.

The belt consists of a large number of individual ore bodies and clusters of ore bodies known locally as "trends." Although each ore body is an integral part of the mineral belt, they all lie roughly at right angles to it and strike in a general way toward the mountains.

No explanations of the cause of the mineral belt have been accepted throughout the profession. The author believes it to be the edge of influence of the mountains—the curving plane along which the strata change their

(Continued on page 56)

Cretaceous

Mesa Verde: Sandstone, shale and coal. 1000-5000 feet.
Mancos: Black marine shale. 500-5000 feet.
Dakota: Conglomerate and sandstone, interbedded shale. 10-400 feet.

Jurassic

Morrison

Brushy Basin: Soft shale. Some sandstone lenses. 200-400 feet.

Westwater: Sandstone. 0-100 feet. Pinches to north.

Recapture: Sandy siltstone. 0-100 feet. Pinches to north.

Saltwash: Sandstone interbedded with shale. 0-350 feet. Pinches to south.

Summerville: Siltstone. 40-100 ft.

Todilto: Limestone. 0-30 feet.

Entrada: Massive sandstone. 50-300 feet.

Carmel: Siltstone. 0-50 feet. Pinches to east.

Navajo: Massive sandstone. 0-600 feet. Pinches to east.

Kayenta: Lenticular sandstone. 200-400 feet.

Wingate: Massive sandstone. 200-400 feet.

Triassic

Chinle: Soft shale containing occasional sandstone lenses. 300-1000 feet.

Shinarump: Sandstone and conglomerate. 0-300 feet.

Moenkopi: Siltstone. 0-600 feet. Pinches to east.

Permian

Cutler: Sandstone, conglomerate and shale. 1000-1500 feet.

Pennsylvanian

Hermosa

Upper Hermosa: Cherty limestone. 100-300 feet.
Paradox: Salt, shale and gypsum. Originally about 800 feet.

Mississippian

Exposed only on Mogollon Rim.

Devonian

Exposed only on Mogollon Rim.

Silurian

Absent.

Ordovician

Exposed only on Mogollon Rim.

Cambrian

Exposed only on Mogollon Rim.

Pre-cambrian

Apache quartzite
Troy quartzite: About 300 feet.
Mescal limestone: Soft and shaley. 200 feet.
Dripping Springs quartzite. About 300 feet.
Pioneer shale: 50-100 feet.
Conglomerate: 10-15 feet.

Pre-cambrian Complex

Stratigraphic Column of Colorado Plateau Area

A modern main line mine belt conveyor

Man Trips and Supply Hauling

A Report of the Committee on Conveyor Haulage Outlining Three Typical Methods of Transporting Men and Supplies Underground

By H. W. MEADOR,
R. W. STOREY
and
D. A. ZEGEER

THIS study is designed to outline the procedure for determining the cost of handling man trips and supplies in a belt conveyor mine. Three methods are considered: (a) Rubber tired tractor and trailers; (b) Rail haulage with the supply track in an entry paralleling the conveyor; (c) Belt reversing. A hypothetical panel is set up with certain general assumptions as listed below. Each method of supply and man trip handling is theoretically applied to this panel. Then the advantages of each type of haulage are outlined and an estimated cost is submitted covering investment, maintenance and operating expense. Costs are based on actual belt operations underground, adjusted to the assumed conditions of the panel.

Objective of the report is to illustrate the factors to be considered in a cost estimate and it is not the intent in any way to advocate one system over another. Furthermore, it is obvious that the selection of the men-and-supply handling equipment is dependent on more than theory. Seam conditions, mine projection, layout of belt system, length of travel, method of roof support, number of men and amount of supplies to be transported are all matters that will determine, or at least influence, the selection and must be carefully studied. Actually, because of the different travel time required for different methods of transporting men, the work time at the face and therefore the production would vary from one haulage method to another. In fact this might be a very important item in considering the type of haulage for any given mine, but for purposes of this report the man-hours of travel time are not included in the estimate.

Assumptions for a Theoretical Panel

It is not proposed to compare one system against another, but to illustrate the recommended method for making a cost estimate, each type of supply haulage equipment is applied to the same operating conditions. The theoretical panel is assumed to be in a 48-in. coal seam having a hard, sandy shale roof and a fireclay bottom which softens when wet. The mining method and service haulage are not specified. The belt conveyor system starts at the head of the room entry and transports to the outbye end of the panel. Man trips are assumed to come to the room necks or within a short distance of the working faces. Supply handling to the face is included only in the belt reversing mine. The data selected for the test section are as follows:

Panel Dimensions—600 ft by 2500 ft

Tonnage @ 80 percent recovery—192,000 tons

Two shifts daily @ 160 tons per shift

Work days per panel—600

Work days per year—220

Years to mine panel—2¾

Number of men employed in panel—10

Report A—Rubber-tired Haulage

An operation with rubber-tired equipment to haul men and supplies will perhaps vary with mining conditions and practices. Seam height, character of mine floor, drainage, grades, maximum rolls or dips all have an effect on the haulage performance. However, the following minimum of equipment is assumed for purposes of this estimate with initial costs as shown.

1—Rubber-tired tractor, battery powered.....	$10,400
1—Spare battery for tractor	2,200
½—Battery charging station	600
2—Rubber-tired trailers.	2,000
Total	$15,200

Depreciating the above equipment over a five-year period, the cost for one panel for 2¾ years would be $8350. To this should be added $200, half of the cost of installing a battery charging station. This results in a total panel cost of $8550.

Maintenance and Operating Cost

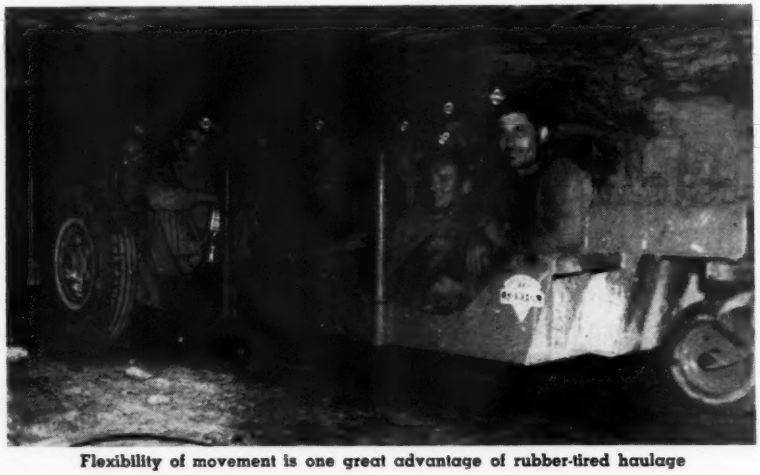
Rubber-tired equipment requires relatively good roadways and the maintenance costs of these roadways will probably vary over a wide range. Drainage is the most important factor. Scraping or grading will be required in some locations at various times, and always rockdusting. The following costs of labor and supplies are based upon an estimate of one year's requirements.

	Labor Man Days	Labor Cost	Materials Cost
Equipment repairs	25	$500	$600
Surfacing roadway	12	240	150
Timbering	10	200	200
Roadway maintenance	29	580	350
Annual Cost		$1,520	$1,300
Panel Cost 2¾ year Total		4,180 $7,760	3,580

The daily operating labor to load and haul the necessary sectional supplies would be approximately ⅓ man day per section for two shifts, $1470 per year. Labor to handle battery charging would amount to ¼ man day per section for two shifts, $1100 per year. The total annual operating cost would be $2570, or $7070 for 2¾ years.

Summary of Cost

	Per Panel	Per Ton
Investment	$8,550	$0.045
Maintenance	7,760	0.040
Operating	7,070	0.037
Total	$23,380	$0.122



Flexibility of movement is one great advantage of rubber-tired haulage

Advantages of Rubber-Tired Equipment:

(1) The equipment can go practically anywhere in the mine since it doesn't need track.
(2) Supplies and repair parts could, if desired, be delivered right to the working face.
(3) For a given mining height, more usable height is available for rubber-tired equipment, since there is no track.
(4) No overhead trolley wire is used. Thus, this hazard is eliminated.

Report B—Track Haulage

This operation assumes a 30-lb rail track laid on the entry paralleling the belt haulage, with a trolley locomotive and supply car for transporting material and a jeep for the man-trips. Initial costs are estimated below.

A small locomotive would handle supplies for two sections or more. This would cost approximately $10,000. If depreciated in 10 years, the cost for one panel for 2¾ years would be $1375.

One supply car would be used per panel. The initial cost would be $1200 depreciating in 10 years. This makes a cost of $330 per panel for its life of 2¾ years. A jeep to haul men in and out of the section costs $2800. Again, if depreciated in 10 years, this would make a panel cost of $770 for 2¾ years.

The track would require the labor of 1½ man days to lay 150 ft. At $20 per man-day, this results in a labor cost of $20 per 100 ft and total labor to install and remove 2500 ft of panel track would be $1000. The cost for 100 ft of 30-lb rail, ties, etc., is approximately $180. The investment for the average amount used per panel (1250 ft) for 2¾ years would be $620.

Trolley wire would require the labor of two man-days to handle the materials and hang 300 ft. At $20 per man-day this means $13 per 100 ft of trolley. Half this amount, or $7 per 100 ft, would be required to take down the wire. Thus, the total labor cost to install and remove 2500 ft of trolley per panel would cost $500. The cost for 100 ft of 4/0 trolley wire and accessories is $40. The investment for the average amount used per panel (1250 ft) for 2¾ years would be $140, figuring again on a 10-year depreciation period.

Total Initial Cost Per Panel

Locomotive	$1,375
Supply Car	330
Man-trip Jeep	770
Track	1,620
Wiring	640
Total	$4,735

Maintenance and Operating Costs

The cost to maintain the haulways and equipment depends upon numerous factors, such as type of roof, pitch of seam, and treatment of equipment. For the purpose of this study, the amount of labor and supplies used will be based upon an approximation of one year's requirements.

	Labor Man-days	Labor Cost	Materials Cost
Equipment repairs	7	$140	$300
Track and Wiring repairs	10	200	200
Timbering	10	200	200
Road maintenance	23	460	300
Annual Cost		$1,000	$1,000
Panel Cost 2¾ years		2,750	2,750
Total		$5,500	

The labor required to load and haul the necessary sectional supplies would be approximately ½ man-day per section for two shifts. This is an annual cost of $2200, and a cost of $6050 per panel.

	Per Panel	Per Ton
Investment	$4,735	$0.025
Maintenance	5,500	0.028
Operating	6,050	0.032
Total	$16,285	$0.085

Track haulage is faster over long distances

Advantages of Track Equipment

(1) No charging station nor battery maintenance needed.

(2) A locomotive can haul a bigger pay load and serve more sections.

(3) The trolley wire and track serve as additional conductors.

(4) For longer distances; men supplies, and supervisors are transported in and out of the section in a shorter period of time.

Report C—Belt Reversing

This report is based on a belt reversing operation in a mine working an average seam height of 36 to 40 in. Wide rooms are driven to a depth of 550 ft from the mother belt, giving a panel width of 1100 ft. The number of men on the belt panel for such an installation includes five face men for each of the six-room units, three engine men, three utility men, one loading point operator, one electrician and a foreman; a total of 39. This installation is quite different from that set forth for the hypothetical belt panel, but two cuts, 5½ ft in depth in each of the six rooms, gives a shift tonnage of 680; or 17.4 tons per man. The hypothetical panel specifies 160 tons per shift from 10 men, or 16 tons per man, so the actual mine production is certainly comparable.

Delivery of men and materials to the face by belt reversal eliminates any operating cost for these items. There will be no depreciation of haulage equipment. No maintenance for such equipment or power for extra equipment operation.

Belt reversing requires no auxiliary haulage equipment

Cost of Non-Productive Time

All costs for handling supply and man-trips are based on the cost of non-productive time in the panel due to the method of transportation by belt reversing. Applying a system of belt reversal to the hypothetical mine panel develops the following data:

The allowable 10 men would work two wide rooms, with three face men in each, one utility man, one engine man for the two room conveyors, one loading point operator and one foreman.

The average haul will be 1250 plus 150, or 1400 ft.

Travel time for men to face will require six minutes, and return at end of shift will require six minutes. Loading supplies would start after the men have reached the face and would require five minutes to load all supplies. Last item of supplies would deliver to face six minutes later, making a total of 11 minutes for supplies.

Dead work at face at beginning of the shift, before coal can start, is variable, depending on conditions left by the preceding shift, but generally, delivery of coal to the side track begins within one to five minutes after the last supplies are delivered. The time for handling supplies is no delay. The men begin their preparation for coal loading on arriving at the face and this work proceeds during the 11 minutes required to bring the last supply item to the face with one of the face men unloading the supplies during the last five minutes of this period.

The non-productive time at the face is, therefore, only the 12 minutes required for transportation of men. This amounts to 2.50 percent of the 480 minutes in the shift. In accordance with the assumptions, no period of time was set up in the hypothetical case to cover man-trip time from portal to the side track.

The production rate in the hypothetical case is 16 tons per man-shift, which gives a labor cost of $1.25 per ton. The cost per ton for the 12 minute non-productive time is 2.50 percent of $1.25, or $0.032 per ton.

Investment and Maintenance Costs

The total capital expenditure for mother conveyor with 5000 ft of 30-in. conveyor belt, two room conveyors with 1200 ft of 18-in. belt and two chain face conveyors, with all cable and miscellaneous equipment for the panel is $85,000. On a ten-year life this is $8500 per year. With 2.7 years to work out the panel, the total capital outlay is $23,800. The recoverable tonnage is 192,000 tons which gives an investment cost of $0.124 per ton, from the previous proportion of 2.50 percent of $.124 is $0.003 per ton.

Power costs for mining with this system average $0.075 per ton of coal based on total power consumption for the mine. Again, 2.50 percent of 0.075 is $0.002 per ton for the non-productive time.

Maintenance of conveyor equipment in our mining scheme costs $0.14 per ton and 2.50 percent of 0.14 is $0.004.

COST SUMMARY

Mine labor cost	$0.032
Power cost	0.002
Equipment cost	0.003
Maintenance cost	0.004
Total cost	$0.041

This extremely low cost of four cents per ton for transportation of men and supplies on the panel indicates the efficiency of belt reversal for mining low height coal seams with the methods we are using.

Advantages and Disadvantages

Many advantages of belt reversal for transportation of men and supplies are not present when other mining practices are followed. Replace the room conveyor and face conveyor with shuttle car and loading machine, and supplies would have to be rehandled and by slower methods. Seam conditions that would not stand the 75-ft width rooms would require different equipment and more room units to produce the same tonnage. Higher coal seams that would not require brushing for haulage height would make track haulage more attractive than in the low seams. Low coal seam mining when the coal height is 36 to 40 in. with a sandstone top, makes the 75-ft width room practical to load by hand onto face conveyors. Belt conveyors to carry from the face conveyors to the mother conveyor also creates ideal conditions for transportation of men and supplies by belt reversal.

A disadvantage of the system of belt reversal that occasionally creates a delay occurs when an emergency necessitates transportation of a piece of equipment or item of supply to the face during the shift. In such a case room belts must stop, the "mother" belt run empty of coal, and then reversed. Such an occurrence is rare, and has proved to be of minor importance at the mine from which the above data have been taken.

Uranium Deposits

(Continued from page 52)

attitude from approximately horizontal to a dip of several degrees onto the flanks of the mountains. The salt domes surrounding the mountains have so obscured such simple structures that it would be difficult now to prove any such contention.

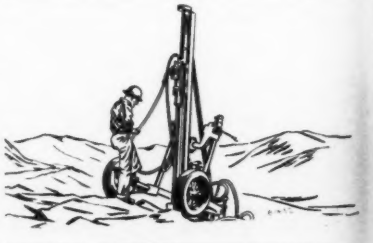
The Salt Wash is not as well exposed around the other groups of mountains as in the vicinity of the La Sals. There is an increasing mass of evidence, however, that rings similar to the Uravan Mineral Belt surround them. From the evidence now at hand, it appears that the distance between the mineral belts and the mountains is proportional to the size of the mountains. For example, the Uravan belt lies from 12 to 18 miles from the igneous contact in the La Sal Mountains, about 12 miles in the smaller Abajo group, five miles in the Carrizos and only three or four miles away from the very small southern peaks of the Henry Mountains.

Relation of the deposits to structures of the Third Order: The salt anticlines and related structures such as the Uncompahgre Plateau also have had their influence on ore deposition, although they are only slightly mineralized, except where the curving Uravan mineral belt crosses them. At each intersection of the belt with the higher portions of the anticlines, are found excellent concentrations of ore. Production from the belt at its crossings with the synclines on the other hand has been meager. There is also a noticeable widening of the belt in the vicinity of the axes of the anticlines. For example, ore extends intermittently for 10 miles along the crest of the Dolores Anticline, but in the Dolores Syncline only one small deposit has been found in spite of numerous exposures of the Salt Wash. It is this feature which evoked the statement that the Uravan Mineral Belt ranged from 0 to 10 miles wide.

Relation of the deposits to structures of the Fourth Order: We now arrive at the relation of ore deposits to fractures. Ore is now being mined from two vertical northwesterly striking faults associated with the salt anticlines. One such location is the Rajah Mine and the other, the Radium Cycle. All known ore in these mines is in fractures. In the mines on the southern side of the Paradox anticline such as the Joe Dandy and Monogram, there is a pronounced thickening of the bedded ore in the vicinity of the faults and some uncrushed ore has been removed from the faults themselves. In the Zuni Uplift ore is now being removed from a breccia pipe and at Temple Mountain in the San Rafael Swell, three slightly developed breccia pipes display radioactivity at surface. In many mines, the ore bodies are parallel to faults or strong joint systems. In some instances, the fracture control is obscure unless it is determined that the rolls are fractures. As our knowledge of the Plateau increases, a fracture control of every deposit in the region will be recognized.

A most effective means for the observation of the fractures controlling ore deposition in any given area is a study of aerial photographs available from the U. S. Geological Survey, the Soil Conservation Service and other agencies. After observing on the photographs those fractures which, at their emergence on an ore bearing rim, coincide with the locations of mines, it is possible to enter the mines, ascertain that the ore bodies are oriented with the observed fractures and with these data, determine where to drill at locations removed from the rims.

For illustrative purposes, the structural picture of the Plateau and its relation to the ore deposits have been made to appear uncomplicated. In reality, the structures are very complex. Unless you feel that Lady Luck smiles upon you, many months of study of the ore occurrences in any area are recommended prior to heavy investments of money.



How Well Does Your Present Source Compare With National's COMPLETE Facilities For Motor and Generator Repair

Most motor repair shops can perform some of the operations listed below. Very few can handle them all. These are not routine operations, but extras which require expensive specialized equipment and experience. National service includes all 17 operations. How does your present repair source compare?

plus value operation	*available at National*	*at your present repair source*
1. redesigning and modernizing by competent engineers	yes	
2. vapor degreasing to insure good bonding of varnish	yes	
3. corncob blasting to prepare surfaces like new	yes	
4. rebuilding and remachining to standard of mechanical fits	yes	
5. temporary hotbanding to seat coils in slots	yes	
6. hot rerolling of permanent bands	yes	
7. grinding and polishing of journal shafts	yes	
8. vacuum impregnating	yes	
9. dynamic balancing	yes	
10. grinding and polishing of commutator at top operating speed	yes	
11. load testing	yes	
12. high frequency testing	yes	
13. electronic bar-to-bar and high sensitivity ductor testing	yes	
14. surge comparison testing	yes	
15. high potential ground testing	yes	
16. magniflux testing	yes	
17. anti-friction bearing inspection	yes	
Total	17	

If you can't answer "yes" for your present source on all 17 operations, you're taking unnecessary chances on getting less than the best repair work. You can't tell in advance on which jobs National equipment and National know-how will pay off in improved performance or longer life. So play it the one safe way — make National your first source for *all* motor and generator repairs.

For more details on why the motor or generator you send to National will often come back better than new, call your nearby National field engineer today. Or drop us a line for his name and address.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

DENVER Steel-Head

BALL AND ROD MILLS

Right hand 6'x10' Denver Steel-Head Rod Mill with Denver Spiral Screen on discharge.

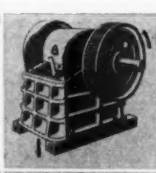
- **RUGGED CONSTRUCTION**
  . . . means lowest maintenance
- **SIMPLICITY**
  . . . means low cost
- **STEEL HEADS AND STEEL SHELLS**
  . . . mean greatest strength
- **DIAMETERS MEASURED INSIDE LINERS**
  . . . mean largest capacity

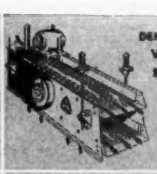
We would appreciate the opportunity to tell you more about the distinctive features of Denver Steel-Head Ball and Rod Mills. Two publications we would like to send you are: New 36-page Denver Ball and Rod Mill Bulletin No. B2-B13 and Flowsheet Study M7-F29 on comparison of single and 2-stage grinding. This study shows actual savings on consumed horsepower, shipping weights and equipment costs for tonnages from 50 Tons/24 hrs. to 550 Tons/24 hrs. Write to

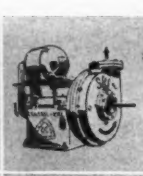
COMPLETE MILL SERVICE FROM ORE TEST TO MILL INSTALLATION

"The firm that makes its friends happier, healthier and wealthier

DENVER EQUIPMENT CO.
00 17th St., Denver 17, Colorado


DENVER JAW CRUSHER

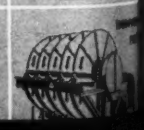

DENVER-DILLON VIBRATING SCREEN


DENVER SRL SAND PUMP

DENVER "SUB-A" FLOTATION MACHINE

DENVER AUTOMATIC SAMPLER

DENVER SPIRAL RAKE THICKENER



Courtesy Union Pacific Railroad

Much of the mica mined and prepared by primitive methods plays an essential role in our modern civilization

The Sheet-Mica Industry

Can We Modernize Some of Its Primitive Features?

By W. F. DIETRICH and W. H. WAGGAMAN

Chief, Ceramic and Fertilizer Branch
and
Commodity—Industry Analyst, Respectively
Bureau of Mines, U. S. Department of the Interior

A REVIEW of various industries reveals instances where primitive processing steps continue to be employed along with new and improved technical developments. Moreover, in an effort to correlate the old with the new, certain industries have developed a multiplicity of testing methods and adopted a confusing set of definitions containing overlapping and contradictory terms.

It is no simple matter, however, to discard old and outmoded systems in favor of better, more modern ones. Established custom and long usage are such that even a relatively slight change is often regarded as a major operation to be undertaken only when there is general agreement that it is necessary and desirable.

The mica industry is perhaps an outstanding example of an industry in which both primitive and modern methods continue to be practiced. It also provides an example of how confused terminology and inadequate descriptions not only render the determination of mica qualities difficult but cause disagreement between the producer and consumer concerning the value of the product.

Mica Industry a Paradox

Sheet mica is essential to the national economy and to the national defense. Its unique properties, coupled with the fact that the United States depends largely on foreign sources of supply has placed this mineral high on the list of strategic or critical materials.

Unlike many other ores and minerals, however, sheet mica does not lend itself to concentration, beneficiation, and mass production by standard ore-dressing methods. No machine has yet been developed to compete with the cheap skilled Indian labor employed in sorting, splitting, trimming and dressing sheet mica. In fact, as long as the present low wage scale in India prevails, there is little incentive to devise mechanical equipment to take over the ancient manual steps now employed in preparing sheet mica for the market.

The generally accepted method of judging the quality of mica is primitive and unsatisfactory. It is evaluated largely on the basis of visual evidence, which entails inspection of each individual piece or block for impurities and structural imperfections.[1]

In sharp contrast to these primitive preliminary steps, American ingenuity and engineering skill have devised efficient and economical methods for

[1] A. S. T. M. Designation: D-351-53T, "Tentative Specifications for Natural Muscovite Mica Based on Visual Quality" (1953).

manufacturing built-up mica plate, board and molded products from thin mica splittings, formerly discarded as waste. These products have replaced, to a large extent the better qualities of block mica formerly employed for electrical insulation, releasing them for more strategic purposes.

In addition, highly mechanized equipment has also been developed for the mass production of fabricated-mica parts that meet the most exacting specifications of the electronic industry.

Confusing Terminology

The unusual number of primitive and modern steps employed in processing sheet mica, the various forms in which this mineral is marketed and certain drastic changes in its end uses have resulted in the development of a highly complex and confusing mica terminology.

Over 130 descriptive terms are employed in the mica industry. Some of these are actually contradictory, while others are so indefinite that they can be easily misinterpreted.

Unquestionably a number of these ambiguous terms could and should be clarified or eliminated, but certain others will be difficult to change, even though their continued use affects the accurate determination of mica values.

Unfortunately, the generally accepted method of evaluating sheet mica is based on slight variation of its visual characteristics. In attempting to define these characteristics, such vague terms are used that even experienced mica inspectors differ as to their meaning.

Considerable progress has been made in determining the value of mica by the application of electrical tests, but these tests are cumbersome and time consuming.[2] So far, no rapid and automatic system has been devised to supplant the generally accepted method of judging the size and quality of mica by visual inspection.

A brief review of the numerous steps involved in mining mica and preparing it for the market shows the confused state of mica terminology and the need for a concerted effort toward its simplification. Such a review also stresses the desirability of developing methods of evaluating mica that do not depend on the judgment of the individual.

Mica Mining

Muscovite sheet mica is derived entirely from pegmatite deposits, but the quality and quantity of mica in a given deposit cannot be determined from geological evidence.

For this reason and also because unweathered pegmatite is a hard rock and expensive to mine, the cost of development, except where a low wage scale prevails, is often greater than the value of the mica recovered.

In the United States, mica mining is rather hazardous from an economic standpoint, and only when premium prices are offered does the domestic output tend to expand.

The sheet-mica-mining industry, both here and abroad, is characterized by numerous small and shallow hand operations, and many of these so-called mines are abandoned when the pegmatite does not promptly reveal substantial quantities of marketable products. The crude mica which must be carefully extracted to avoid damage, is then cobbed to remove loose pieces and adhering impurities and sent to a "mica house" for processing.

The discarded material is accumulated on dumps, which may or may not be subsequently worked over for the recovery of scrap mica.

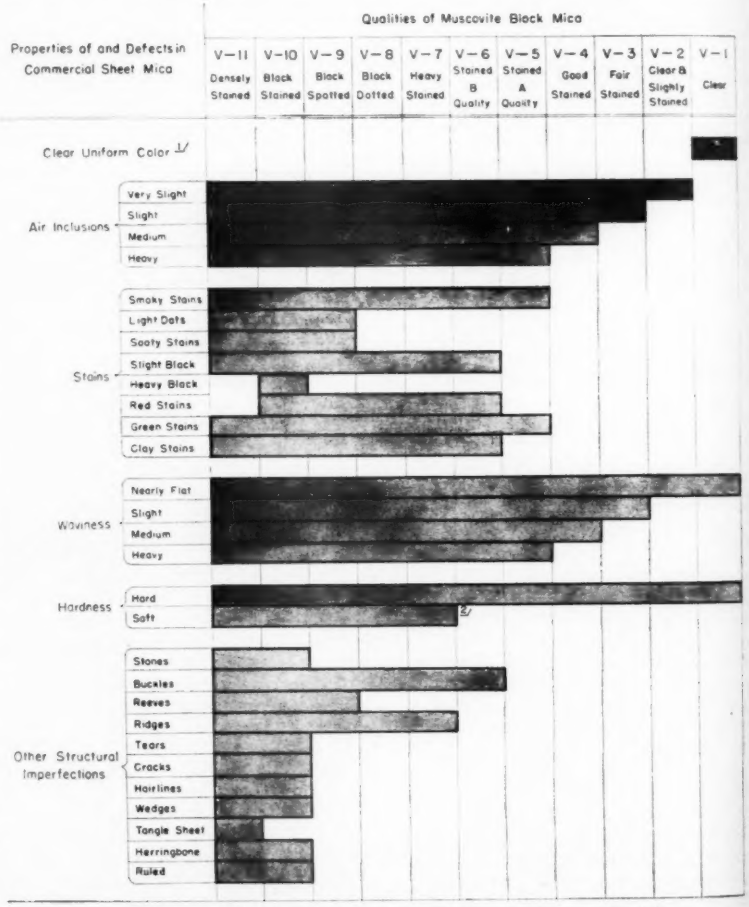
Such terms as "crude mica," "cobbed mica" and "scrap mica" convey rather clearly the general character of the products and byproducts of mining operations, and there is no reason why they should be changed.

Processing Sheet Mica

The term "processed mica" is used to describe the mica that has been rifted, dressed, sized and classified as to quality before fabrication into finished products. Under present conditions, each of these processing steps is a manual operation, dependent upon the skill and judgment of trained and experienced personnel.

Unquestionably, some of these steps could and should be performed by mechanical means, but others will continue to depend on hand labor.

Rifting Mica — Rifting consists in splitting crude mica into sheets or blocks of suitable thickness before trimming or dressing. In the rifting step, loose and imperfect laminae are split off by a knife and discarded as scrap. In India part of this scrap is converted into splittings (thin laminae of various sizes); but in the United States, the bulk of this waste mica is finely ground and employed for pur-



The various factors used in judging quality of mica by visual evidence

[2] Tyler, P. M., "Q Meter Testing as a Means of Augmenting Supplies of Capacitor Mica," Report No. MMAB-28-C, Nat. Acad. of Sciences, Nat. Research Council (1952).

Courtesy Mica Insulator Co.

Low wage scale in India (30 cents per day) holds back progress in mica industry

poses where mica of high quality is not required.

Rifting is a manual operation involving considerable skill and judgment to obtain the maximum amount of good, usable mica. It is unlikely that a rifting machine can be devised to replace hand labor. Rifted mica is a semifinished product and requires further processing before it can be marketed to the best possible advantage.

The term "rifting" and "rifted mica" appear to be apt ones and define rather clearly the operation and the resultant product.

Dressing or Trimming — Dressing and trimming are more or less synonomous terms used in the mica industry to describe the removal of major flaws by the fingers, a sickle, knife, guillotine or shears. Imperfect and torn laminae are split off and one or more edges of the mica block trimmed to yield the largest practicable area of usable sheet.

The purchaser sometimes specifies the means whereby the mica is to be trimmed, but his prime interest is in the nature, quality and yield of fabricated products that he can derive from the trimmed mica.

Half-trimmed mica is defined as that on two adjacent sides; three-quarter-trimmed is that trimmed on all sides, with no cracks extending into the pattern; full-trimmed mica is dressed on all sides with all major physical imperfections removed.

To facilitate further splitting of the trimmed sheet mica into blocks and films of specified thicknesses, the edges of full-trimmed mica are usually cut at an angle of 45°.

Mica dressing or trimming is also a manual operation that is not apt to be replaced by a machine, but the adoption of a single system of full-trimming block mica with beveled edges would simplify the subsequent processing steps (grading and classifying) and eliminate six terms now used in describing this operation.

Whereas it is claimed that the use of full-trimmed mica results in a slightly lower recovery of fabricated-mica products, the fact that the value of mica thus prepared can be more quickly and accurately appraised is a strong argument in favor of this method of trimming.

Grades and Grading—The trimming operation results in mica sheets or blocks of irregular shapes. Since the larger pieces of any given quality of mica bring higher prices, the blocks or sheets are sized by laying each individual piece on a grading chart and shifting it until it covers the maximum size rectangle.

The terms "grade" and "grading," as applied to mica, are unfortunate. In virtually all other industries the grade of either a raw material or finished product indicates its quality. A high-grade ore is one containing a high percentage of the desired ingredient; high-grade lumber is relatively free from knots and other physical defects; and the term Grade A is often applied to a food product to stamp it as of superior quality.

In the case of mica, however, the term grade is used to designate size, and grading is the process of separating sheet mica into various sizes.

Since grade and grading mean size and sizing, these latter terms should be adopted to avoid confusion.

Definite sizes of mica are universally recognized, but the designations or names applied to some of them differ according to the country of origin. Such terms as "Special," "Extra Special," "Extra Extra Special" and "Over Over Extra Special" are employed in defining unusually large mica blocks, but these terms do not apply to the same sizes in every mica-producing country, as shown in Table I.

There is a need for general agreement and adoption of a uniform system of designating sizes which will be internationally recognized. Certainly such a term as "Over Over Extra Extra Special" verges on the ridiculous.

Classification — The value of mica depends primarily on its quality or suitability for certain specific end uses. No matter how large the sheets or blocks may be, unless they are relatively free from impurities and structural imperfections their usefulness often is quite restricted.

The determination of mica quality therefore is the most important of all processing steps, yet the term used to desribe it, namely, "classification," is highly ambiguous.

The generally accepted meaning of this term in the mineral industry is to separate minerals of the same den-

Courtesy Mica Insulator Co.

Hand drilling by candle-light is still standard practice in Indian mica mines

TABLE I.—COMPARISON OF SIZE DESIGNATIONS OF MICA FROM VARIOUS COUNTRIES

Area of Min. Rectangle in Sq. In.	ASTM Grade Sizes	Domestic Mining, In.	Madagascar	India	Brazil	Minimum Dimension one side, In.
100	OOEE Spec.	8 x 12	0000	OOEE Spec.	OEE Spec.	4
80	OEE Spec.	8 x 10	000	OEE Spec.	EE Spec.	4
60	EE Spec.	6 x 10	00	EE Spec.	E Spec.	4
48	E Spec.	6 x 8	0	E Spec.	Special	4
36	A1 (Spec.)	6 x 6	A1	Special	A1	3½
24	1	4 x 6	1	1	1	3
15	2	3 x 5	2	2	2	2
10	3	3 x 3 & 3 x 4	3	3	3	2
6	4	2 x 3	4	4	4	1½
3	5	1½ x 2 & 2 x 2	5	5	5	1
2¼	5½	Circle	6	5½	5½	⅞
1	6	"	6	6	6	¾

sity by size, thus facilitating their subsequent concentration. Classification may also be defined as the systematic arrangement of similar minerals into groups. Muscovite, phlogopite, and biotite are types or classes of mica that may or may not be of high quality.

To avoid confusion, the present term "classification" of mica should be changed to "determination of quality."

As previously stated, the quality of mica is judged largely on the basis of visual evidence.[1] Slight differences in color, the nature and extent of stains and air inclusions, various degrees of waviness and other physical imperfections are presumably taken into consideration in determining the suitability of mica for certain specific purposes.

The character and proportion of these impurities and structural defects however, are so ill defined that further confusion in mica terminology has resulted.

In view of the fact that the present end uses of mica depend chiefly on its electrical properties, the determination of quality by visual inspection alone is not illogical but does not permit utlization of the world's mica resources to the best possible advantage.

According to visual classification, sheet mica is divided into the following 11 vaguely defined qualities.[1]

(1) Clear.
(2) Clear and slightly stained.
(3) Fair stained.
(4) Good stained.
(5) Stained A quality.
(6) Stained B quality.
(7) Heavy stained.
(8) Black dotted.
(9) Black spotted.
(10) Black stained.
(11) Densely stained.

Each of these qualities depends on the presence or absence of 4 degrees of air inclusions, 6 types of stains, 4 degrees of waviness and 11 miscellaneous types of structural imperfections.

Determination of the first three qualities of mica (and possibly the fourth) by visual examination is not too difficult, but when it comes to the lower qualities, where one is called upon to distingiush the difference between "*slight*" and "*medium*" amounts of air inclusions; "*smoky, sooty,* and *black* stains;" "*nearly flat*" and "*slight*" degrees of waviness; and the nature and extent of 11 miscellaneous types of physical imperfection, one cannot but be skeptical of such a system.

Need New Methods

The necessity of more scientific methods of classifying and standardizing mica was clearly evidenced in the early part of World War II as new and highly technical electronic devices came to play an increasingly important role. The millions of fabricated mica parts of intricate design which were required placed a severe strain on the available supply of the higher qualities of this mineral.

Electrical equipment for testing the suitability of some of the lower qualities of mica under conditions simulating those which it would be required to meet, has resulted in the use of such mica for purposes for which it was formerly considered unsuitable.

The prejudice against non-ruby mica has been partially overcome and thus the market for green mica expanded.

Electrical testing in its present stage of development however, is both time consuming and costly. In spite of the fact that the visual method for determining the quality of mica is subject to the errors of individual judgment, it will continue to be employed until a rapid and automatic system of testing is developed. Here is a challenging problem for the American scientist and engineer, the solution of which would prove highly beneficial to the entire mica industry.

Thickness of Mica

Sheet mica of several qualities is marketed under four broad headings according to its thickness.

The A. S. T. M.[1] defines these four groups as follows:

1. Mica block 0.007 in. and thicker.
2. Mica thins 0.002 to 0.007 in.
3. Mica films 0.0008 to 0.007 in.
4. Mica splittings 0.0006 to 0.0012 in.

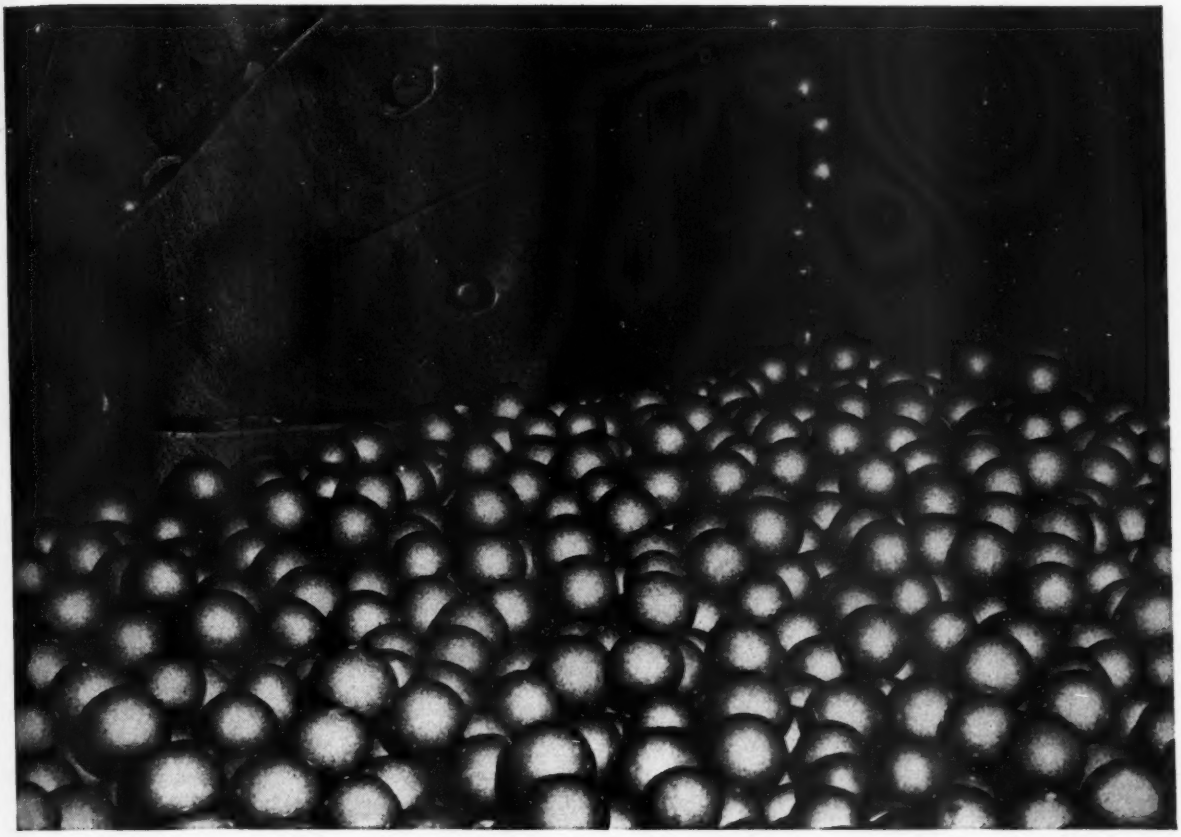
It will be noted that there is an overlapping in the thickness of films and so-called thins, as well as films and splittings. Moreover, these definitions are not strictly adhered to by the mica industry.

To further complicate the terms defining thickness, the second category

(Continued on page 77)

Courtesy Huse-Liberty Mica Co.

Electronic gauges automatically separate mica pieces differing in thickness by as little as 0.0025 in. and count number of pieces in each category



You Can Cut Costs Here

SHEFFIELD
ARMCO
MOLY-COP
TRADE MARK
COPPER · MOLYBDENUM · ALLOY
GRINDING BALLS

Sheffield copper molybdenum alloy steel grinding balls are manufactured by automatically controlled methods which produce a ball of finer, denser, more uniform structure.

Moly-Cop balls wear evenly and retain their spherical shape longer. They have greater hardness for wear and toughness to resist spalling and chipping. This all adds up to high production rates with less down time, less charging and less power.

Moly-Cop grinding balls can make an important net saving in your grinding cost.

If you have not already proven the value of Moly-Cop balls, get in touch with us before making your next purchase.

SHEFFIELD STEEL
DIVISION
ARMCO STEEL CORPORATION
SHEFFIELD PLANTS: HOUSTON KANSAS CITY TULSA

EXPORT REPRESENTATIVES: **ARMCO INTERNATIONAL CORPORATION** · Middletown, Ohio

Wheels of GOVERNMENT

AMC

As Viewed by HARRY L. MOFFETT of the American Mining Congress

WITH Congress and the President both out of Washington only a trickle of news of interest to the mining industry is emanating from the various Government Departments and agencies.

It is expected that the Washington atmosphere will heat up some when the Senate reconvenes on November 8 to consider the recommendations of a special subcommittee calling for censure of Senator Joseph McCarthy (Rep. Wis.). While the House has adjourned sine die and can only be called back by the President, the Senate may still transact any unfinished business on its calendar that does not require further approval by the House. The 84th Congress will meet January 5, 1955. Unless the President calls a special session of the entire 83rd Congress, all bills pending on its adjournment will die and will have to be reintroduced in the new Congress if they are to be acted upon.

The off-year campaign for the control of the next Congress is in the home stretch. President Eisenhower is taking an active part in an effort to bring back a Congress that will support his legislative program. At this writing only the voters know which way the pendulum will swing in the coming elections.

Stockpiling Plans Announced

The Office of Defense Mobilization has revised procurement plans for strategic and critical minerals and metals for the 1955 fiscal year and has sent new purchasing instructions to the General Services Administration. New procurement is expected to total about $145,000,000 and purchases are to be made of aluminum, asbestos, bauxite, beryl, chromite, diamonds, fluorspar, manganese ore, mica, nickel, selenium, talc, tantalite, rare earths, and tungsten.

The revised program also calls for transfer to the national stockpile of some $400,000,000 of materials which are being delivered to the Government under expansion programs undertaken previously under the Defense Production Act. To be transferred are such minerals and metals as aluminum, asbestos, beryl, chromite, cobalt, copper, mica, molybdenum, nickel, and tantalite.

In announcing the revised program, ODM said that domestic open market procurement toward long-term stockpile goals is to be undertaken over a considerable period of time and at favorable prices. The agency also declared that long-term goals will also be met by transfer of Government-owned surplus materials and through acquisition and barter of foreign produced materials, as authorized under the new Agricultural and Trade Development Assistance Act.

The long-term procurement program authorized in the new ODM directive calls for open market purchases of antimony, chromite, lead, manganese, and zinc, and for transfer to the stockpile of lead, manganese, tin and zinc acquired under defense expansion programs.

General Services Administration will notify the Department of Agriculture of the quantities of metals and minerals that may be acquired from foreign sources to meet long-term stockpiling objectives. The minerals and metals involved include: aluminum, asbestos, bauxite, beryl, chromite, copper, diamonds, graphite, manganese, mica, platinum, selenium, talc, and titanium. ODM made it plain that barter will not be used to acquire foreign minerals and metals if the same amounts of such materials are available from domestic production. The mobilization agency also pointed out that the supplemental stockpile, authorized under the Agricultural Trade Development and Assistance Act provides for the purchase of strategic and critical materials with foreign currencies that may be acquired from the sale of surplus agricultural commodities. This stockpile is in addition to the national stockpile and is subject to the same provisions with respect to disposal of materials as is required in the case of the national stockpile.

★ ★ ★ ★ ★ ★ ★

Washington Highlights

STOCKPILING: 1955 plans disclosed
COAL EXPORTS: FOA program starts
COAL AID: Industry suggests relief measures
DEFENSE PRODUCTION: New law being prepared
MINING LAW: Changes reviewed
T-H REVISIONS: To be sought next year

★ ★ ★ ★ ★ ★ ★

Coal Export Program

The Administration has announced that it will undertake a program calling for the export of 10,000,000 tons of coal from the United States to "free" countries abroad. The plan includes shipments to Spain, South Africa, and to countries in Southeast Asia. It is expected to cost about $150,000,000.

Director Harold Stassen of the Foreign Operations Administration, which will carry out the program, has told reporters that his agency is endeavoring to relate the purchase within the total of 10,000,000 tons to areas of highest relative unemployment, as determined by the Secretary of Labor, consistent with the types and qualities of coal for which there is demand.

It is understood that funds have been obligated to take care of purchase authorizations for Spain of 118,000 tons and 70,000 tons for Greece.

Full details as to the implementing of the program have not been announced.

Coal Industry Offers Recommendations

The Federal Government's Interdepartmental Coal Committee, headed by ODM Director Arthur S. Flemming, has received recommendations from the Bituminous Coal Industry Com-

mittee for legislation to place drastic curbs on expanding production and use of natural gas and on imports of residual fuel oil. Such recommendations, if approved by ODM, could not be acted on until the new Congress convenes in January.

The bituminous industry said that it is necessary to place some restraints on the expansion of the natural gas industry at the expense of coal.

The industry also came up with a number of recommendations for immediate direct action by the Federal Government to relieve widespread coal mine shutdowns and unemployment. These included: (1) issuance by the President of a directive curtailing the volume of residual oil imports, (2) Government action to give preference to coal as a fuel for atomic energy plants and all other Government installations, and issuance of an order requiring that coal be used in the manufacture or delivery of goods to the Federal Government, (3) establishment of a Federal requirement that imports of residual oil be accompanied by the importation of a proportionate amount of higher grade petroleum products and a requirement that total imports of petroleum products be limited to the amount needed to supplement domestic production, and (4) Federal encouragement to foreign petroleum producing countries to convert their refineries to more modern types which produce less residual and more highly refined products.

The Governmental Committee has not yet taken any action upon the industry's recommendations. It has until December 1 to come up with answers to the problems vexing the coal industry.

Defense Act Renewal

In the drafting stage is a bill to provide for renewal of the Defense Production Act for two years beyond next June 30, its current expiration date. It is understood from those within the Administration, who are working on the measure, that it will duplicate many of the provisions of the present law, particularly those dealing with priorities and allocations of materials required for defense and for maintaining a framework of regulatory powers necessary to keep up to date programs for meeting an all out emergency.

It is likely the legislation would also provide for the retention of such an organization as the Business and Defense Services Administration of the Department of Commerce. What proposals may be made for continuation of power to expand mineral production are not as yet known although it is believed that the Administration would wish to retain such authority as now exists in this respect.

It is probable that any new legislation will be promptly proposed to the next Congress and will likely secure fairly speedy approval.

Mining Law Changes

The House Interior Committee has made public a report by its counsel describing changes made in the mining laws.

The report shows that the mining industry fared fairly well with respect to public lands legislation during the 83rd Congress. It termed the multiple mineral development bill, supported by the mining and oil industries, as a major piece of legislation which has opened some 60 million acres of land to multiple mineral development.

It points out that during the past Congress, the President signed measures which (1) extend until July 1, 1958, programs established under the Defense Production Act aimed at encouraging the discovery and development of strategic and critical minerals and metals; (2) increase the size of oil and gas leases; (3) authorize a continuing appropriation of $500,000 annually to control underground and outcrop coal mine fires; and (4) modernize and make more workable the mineral leasing laws in order to encourage exploration and development of public domain gas and oil reserves.

The report pointed out that efforts of the House Interior Committee to obtain passage of the D'Ewart bill to eliminate abuses of the mining laws was stymied when the House Agriculture Committee reported out the Hope bill which would have made several drastic revisions in the mining laws detrimental to the development of mining on the public domain. Both bills were referred to a joint subcommittee of each of the two major committees for resolving the differences in views. To this date no solution has been arrived at as between the two measures.

Taft-Hartley Act Revision

Upcoming in the next Congress are likely to be proposals from the Administration for revising the Taft-Hartley Act. During the past session, efforts to revise the law went down to defeat in the Senate while the House Labor Committee made no move to report out any suggested changes in the law.

However, during recent speeches by Administration officials, including the President, there have been a number of statements to the effect that Mr. Eisenhower will call for labor law revisions at the next session. Most mentioned of changes that may be sought are proposals to eliminate the so-called "union busting" provisions of the law in favor of a provision that would protect the right of strikers to vote in NLRB elections, and inclusion of a provision requiring employers to file non-communist affidavits with the NLRB.

"You may be all right with a blue print, pencil, and carrying a safety lamp, but if you had to cut coal or set timber you would be a flop"

AMC Personals

Eric H. Reichl has been named director of the Research and Development Division of Pittsburgh Consolidation Coal Co.

He succeeds **Howard S. Turner,** who has been named vice-president—Research and Development of Jones & Laughlin Steel Corp.

Reichl joined Pitt Consol early in 1948 and shortly thereafter was promoted to research manager. He is a graduate of the Polytechnic Institute of Vienna, where he received a master's degree in chemical engineering. He came to the U. S. in 1938 and began a technical career in the oil and chemical industries.

E. H. Reichl

Included in Reichl's background has been extensive study of coal-to-oil developments both in Europe and America and also the processing of coal for chemical purposes.

W. Page Morris has been named vice-president and assistant general manager of Duval Sulphur & Potash Co. and has been transferred to the company's headquarters at Houston, Texas.

George E. Atwood was named to succeed Morris as resident manager of the company's potash mine and refinery at Carlsbad, N. M. Atwood has been refinery superintendent and assistant resident manager. **Jerry E. Tong,** mine superintendent, succeeds Atwood as assistant resident manager, and will continue to serve as mine superintendent.

W. P. Morris

Morris, Atwood and Tong have been prominent in New Mexico mining circles for a number of years. Morris is completing his second year as president of the New Mexico Mining Association.

W. C. Batchelor, who has been general manager of sales of The West Virginia Coal & Coke Corp., was recently elected vice-president of the company.

James K. Richardson has been named assistant general manager in charge of Labor, Public and Industrial Relations at Chino Mines Div. of the Kennecott Copper Corp.

Richardson fills a newly created position at Chino Mines Division in New Mexico. The position was established because of expansion of Chino's program in the fields of public, industrial and labor relations, and Richardson's duties will be to coordinate the work in these three fields.

J. K. Richardson

Heath Steel, who is retiring at the end of this year as vice-president and director of the American Metal Co., Ltd., is also retiring as president of Southwest Potash Co., a wholly-owned subsidiary of American Metal. He will be succeeded by **Thomas W. Childs** as president of Southwest Potash.

W. O. Stewart, Jr., has been appointed as superintendent of the Cement City, Mich., plant of the Consolidated Cement Corp. He was formerly plant superintendent at Fredonia, Kan., for the company and will be succeeded there by **A. S. McCrory.**

Stanley D. Michaelson has been named chief engineer of the Western Mining Divisions of Kennecott Copper Corp., according to J. P. Caulfield, general manager. Formerly chief engineer, Raw Materials, for Tennessee Coal, Iron and Railroad Co., Michaelson will make his headquarters in Salt Lake City.

T. G. Gerow, president and director of West Virginia Coal & Coke Corp., has resigned. His successor is **Morris Creditor,** formerly executive vice-president. Creditor is also president of the Ohio River Co., a subsidiary of the West Virginia Coal & Coke Corp.

R. W. Hughes, vice-president and general manager of the Miami Copper Co. and the Copper Cities Mining Co. has announced the advancement of **B. R. Coil** from assistant general manager of those companies to manager.

Coil's first connection with Miami Copper Co. was in 1938 as mine engineer, later becoming mine superintendent at Castle Dome Copper Co.; general superintendent of that company; general superintendent of both Miami and Castle Dome, and later assistant general manager.

B. R. Coil

Marquette Cement Manufacturing Co. has announced the appointment of **J. M. Dowdy** as superintendent of its Superior, Ohio, plant.

K. P. Routh, chairman and president of the Pittston Co. has announced that the activities of the various Pittston Coal Sales Subsidiaries will be combined under the name Pittston Clinchfield Coal Sales Corp. The new sales company, with headquarters in New York City, will be headed by **J. T. Berta** as president. **J. S. Routh, Jr.,** will be vice-president and assistant to the president.

Charles R. Cox, president of the Quebec Iron and Titanium Corp., announced the appointment of **Roy B. Young** as general manager to succeed **F. E. Walling,** resigned. Quebec Iron and Titanium Corp., with mining and smelting operations in the Province of Quebec, Canada, is two-thirds owned by the Kennecott Copper Corp., and one-third owned by the New Jersey Zinc Co.

Young advances from the position of plant superintendent. Before joining Quebec Iron and Titanium Corp. in 1953, he had been associated with the Bethlehem Steel Corp. where he served as assistant general superintendent of the Sparrows Point coke plant.

Roy B. Young

The election of **D. H. Lewis** as vice-president and general sales manager of the Jewell Ridge Coal Sales Co., Inc., has been announced by Dr. Huston St. Clair, president. Lewis previously had been general sales manager.

Byron E. Grant has resigned his position effective November 1 as labor relations director with the United States Smelting Refining and Mining Co.

He is planning to devote his time particularly to the field of management service in relation to independent uranium producers but plans also to do geological consulting work generally in the field of mining. His background of experience includes geology, management in the mining industry and more recently labor relations.

A. L. Zerbey, Jr., has been appointed assistant division sales manager of Island Creek Coal Sales Company's Southeastern Division with headquarters in Greensboro, N. C.

Donald S. MacBride, president, Hercules Cement Corp. and **W. C. Russell**, president, Peerless Cement Co., were elected chairman and vice-chairman respectively of the Cement Advisory Committee of the American Mining Congress at its first meeting in Chicago on September 9. **William I. Powell** of the AMC staff was named permanent secretary of the Committee.

D. S. MacBride

Purpose of the Committee is to foster close cooperation between the cement producers and AMC members representing all other branches of the mining industry. Such cooperation will provide the unanimity of support essential to the efforts of the American Mining Congress in its overall work in behalf of the entire mineral industry.

Fred M. Nelson, president of Texas Gulf Sulphur Co., has announced the appointment of **Claude O. Stephens** as general manager of production. Stephens, a vice-president of the company, succeeds the late Harry A. Swem.

Appointment of **James H. Cunningham**, as director of Public Relations of the National Coal Association, has been announced by Tom Pickett, executive vice-president of the organization. Cunningham, formerly assistant director, succeeds **Ralph C. Mulligan**, one of the senior staff executives of the N.C.A., who is retiring and who will hereafter serve the Association in a consulting capacity.

— *Obituaries* —

SENATOR PAT McCARRAN

AN APPRECIATION

IT is hard, within the limitations of these columns, to do justice to Patrick Anthony McCarran. His personal history and a mere listing of his accomplishments in behalf of his State and his Nation would fill the pages of a book much bigger than this. But they do not need recounting here. They are written for all to see in the laws of the State of Nevada and of the United States of America. Our country lost a great man when the Senior Senator from Nevada passed away on September 28.

He first ran for the position of United States Senator from Nevada in 1926, when he was defeated. The defeat, however, served only as a challenge and in 1932 following one of the most heated elections ever held in Nevada, McCarran won the position he retained to the day of his death.

In his more than 20 years in the Senate, Pat McCarran demonstrated again and again how well he had learned the lessons of his early career. He was always the champion of the mining industry and often demonstrated that he placed his own considered convictions above party when it came to legislating for the benefit of the country.

It is only justice, then, that the memory of this esteemed jurist, legislator and statesman, the Honorable Patrick Anthony McCarran, United States Senator from Nevada, should be held in honor and respect by those whom he represented so long and so well.

Thomas Warner Guy, 70, died in Charleston, W. Va., September 11, following a short illness.

Mr. Guy entered upon his professional career in 1902 as rodman for a surveying party then making line for the Clinchfield Railroad, shortly thereafter being transferred to the Clinchfield Coal Corp. where he became chief engineer. After his discharge from the Army in 1919, Mr. Guy became chief engineer of the Boone County Coal Corp., in Sharples, W. Va. He later was made general superintendent of the company. In 1929 he moved to Charleston, W. Va., and opened an office as consulting engineer specializing in coal preparation.

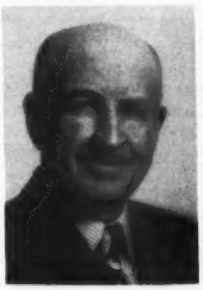
Mr. Guy had established a long record of accomplishments in the development and improvement of mechanical coal preparation in the Appalachian regions. He was an active member of many technical organizations and contributed extensively to their studies and research. He served as Chairman of the American Mining Congress Committee on Coal Preparation for a number of years, and was particularly active in directing committee studies.

FREDERICK STORRES McNICHOLAS

AN APPRECIATION

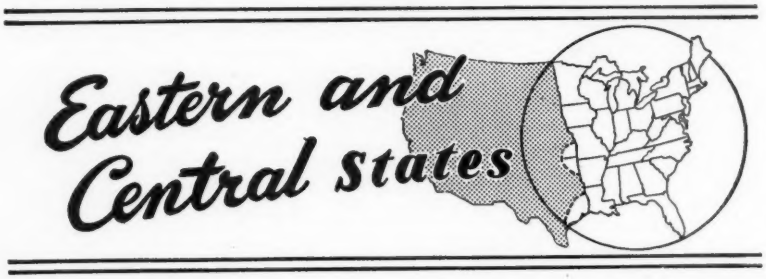
BY W. J. COULTER

A leading authority on block caving, Frederick Storres McNicholas, Denver, Colo., passed away on August 6 after a long illness.



Mr. McNicholas was born in Durango, Colo., May 30, 1888. He graduated from the Durango High School and entered the Colorado School of Mines from where he graduated with an E.M. degree in 1914. After graduation he spent his entire active life in the mineral industry. From 1914 until 1925, Mr. Nicholas worked for Timber Butte Milling Co., American Manganese Co., Chicago Mining Co., Anaconda Copper Mining Co., and Butte & Superior Mining Co. From 1925 to 1936 he was mine superintendent for the Granby Consolidated Mining, Smelting & Power Co. at Anyox, B. C., and from 1936 until retirement in 1951, he was assistant general superintendent and consulting engineer for the Climax Molybdenum Co.

Mr. McNicholas was a recognized authority on open stone and on block caving mining methods. He had written and presented a number of papers on these subjects. He made valuable contributions to the low cost, effiicent mining method developed at Climax and during World War II was largely responsible for the high production of molybdenum made during these critical years. In 1947 and again in 1949 he was called to Northern Rhodesia as a consultant on mining methods being used in the Roan Antelope and Mufulira Mines.



Anthracite Looking Up

Edward G. Fox president of The Philadelphia and Reading Coal and Iron Co. said September 25 that he looks for "a pretty good market ahead for the 1954-55 year in anthracite."

Speaking before the 44th annual Convention of the New York State Fuel Merchants Association at Lake Placid, N. Y., he told his audience that the violent price adjustment of the past two years in anthracite is just about reaching its end.

In his forecast, Fox listed a number of presently favorable conditions. Among these were small inventories of dealers, reduced supplies in storage by producers, and the shortened list of anthracite producers.

"With all of these in mind," he observed, "what would a normal winter do for the anthracite market? And even without very favorable weather," the P & R president continued, "I can see a pretty good market ahead for the 1954-55 year."

Czech Labor Shortage

Czech youngsters leaving school in June were urged to volunteer for mine labor as part of an all-out government drive to recruit more miners to bolster lagging coal production, Radio Free Europe reports.

The Czech communist government, hard hit by recurrent manpower shortages in the mines, is also offering special inducements for men and women willing to dig coal.

To entice more volunteer mine workers from other jobs, Czech field agents are offering three-year contracts with such inducements as salaries up to 3000 crowns ($418.41) per month, a bonus of 1200 crowns, 350 crowns for purchase of working clothes, travel expenses to place of work and a separation-allowance of eight crowns daily for married workers.

A salary as high as 3000 crowns monthly goes only to expert shock workers, RFE said, and the average wage of miners is nearer to 1700 crowns ($237.08). Still, RFE pointed out, mine wages together with the system of special allowances, are comparatively high in a country where average earnings are 1200 crowns monthly.

The constant drive to recruit men—and women—for mine labor indicates, RFE said, the failure of the Czech government to match ambitious production goals against a reluctance on the part of miners to work under conditions of political persecution and notoriously inadequate safety precautions.

Produce Electrolytic Cobalt

As a result of improvements in refining techniques, The International Nickel Co. of Canada, Ltd., has initiated production of electrolytic cobalt at its Port Colborne refinery.

Heretofore Inco's entire cobalt output has been marketed as oxides and salts produced at its Clydach, Wales, refinery.

Inco's electrolytic process for the production of cobalt was developed after extensive research and pilot plant studies by the company.

Cobalt is one of 13 elements recovered from the company's Sudbury District, Ontario, ores. Nickel, of course, is the principal product. The others are copper, platinum, palladium, ruthenium, iridium, rhodium, gold, silver, selenium and tellurium. In addition, Inco furnishes high quality smelter gas for conversion into liquid sulphur dioxide and normal smelter gas for sulphuric acid production. Soon, iron will be recovered as premium grade iron ore.

DAVIS READ
Consulting Engineer
Layout Operation
Modern Production Methods
Plant Design Preparation
Chicago, Ill. 120 S. LaSalle St.
Madisonville, Ky. 235 East Noel Ave.

PETER F. LOFTUS CORPORATION
ENGINEERING and ARCHITECTURAL CONSULTANTS and DESIGNERS
First National Bank Bldg.
Pittsburgh 22, Pennsylvania
Cable Address
"LOFTUS Pittsburgh"

J. W. WOOMER & ASSOCIATES
Consulting Mining Engineers
Modern Mining Systems and Designs
Foreign and Domestic Mining Reports
HENRY W. OLIVER BLDG.
Pittsburgh, Penna.
NATIONAL BANK BLDG.
Wheeling, W. Va.

Annual Conference of the Coal Division

William Penn Hotel, Pittsburgh, Pa., Friday, November 19, 1954

ALL coal operators and mining equipment manufacturers are cordially invited to attend the 1954 Conference of the Coal Division of the American Mining Congress. This will be held at the Wm. Penn Hotel in Pittsburgh, Friday, November 19—a one-day meeting with a morning session convening at 9:30 a. m., a business luncheon, and an afternoon session, adjourning about 4:30 p. m.

The seven committees listed below will present reports on their studies, covering latest improvements in mining practices and equipment. All of these reports are based on actual operations where an ample background of experience has been accumulated. Each subcommittee will submit its report to the Conference. Copies will be available for those who wish to offer discussion, questions or comment from the floor. Everyone present, committee member or not, is urged to take part in these floor discussions and to give the Committees the benefit of his ideas.

Committee on Coal Preparation—R. L. Llewellyn, Chairman, Preparation Problems of Continuous Mining—Maintenance of Cleaning Plant Equipment—Methods and Equipment for Washery Water Clarification.

Committee on Mechanical Mining—Wm. E. Hess, Chairman, Maintenance of Continuous Mining Machines—Gathering Haulage for Conventional Mechanical Loading—Shuttle Car Roadways.

Committee on Underground Power—J. A. Dunn, Chairman, Mine Cable Specifications—Mining Machine Motor Identification—Safe Grounding of Portable and Mobile Mining Equipment.

Committee on Mine Ventilation—A. J. Oppermann, Chairman, Exhaust Dust Collection for Continuous Mining.

Committee on Rail Haulage—J. D. Reilly, Chairman, Standards for Heavy Rail Turnouts—Determination of Proper Mine Car Capacity—Mechanical Loading into Mine Cars.

Committee on Conveyor Haulage—H. A. Jones, Chairman, Man-trips and Supply Haulage for a Belt Conveyor Mine—Flame Resistant Belts—Mechanical Loading onto Belts.

Committee on Roof Action—G. N. McLellan, Chairman, Recommended Thrust and Speed for Rotary Drilling—Maintenance of Roof Drills and Bits—Roof Support for Continuous Mining—Roof Bolt Sizes.

Safety Pays Off

Red Jacket Coal Corp., Red Jacket, W. Va., recently honored five foremen who achieved the outstanding safety record of supervising sections on which a lost-time accident had not occurred for five consecutive years with a two-day, all-expense trip to Washington, D. C. Red Jacket started these awards in 1951 and this group brings to 14, the number of foremen so honored.

Those making the trip to Washington were W. M. Harlow and Curt Matney, Keen Mountain; Orville Godfrey, Coal Mountain mine; Ira Bradford, Wyoming mine; and H. B. Artis, No. 17 mine.

Honor Mining School Dean

Curtis L. Wilson, dean of the Missouri School of Mines and Metallurgy, Rolla, Mo., was one of four men awarded honorary degrees by Washington University, St. Louis, at its 93rd annual commencement June 9.

Before presentation of the honorary degree of doctor of engineering by Chancellor Ethan A. H. Shepley, Wilson was identified as an "outstanding engineer, educator, and head of a distinguished neighboring educational institution" in a degree citation read by Acting Dean of Faculties Carl Tolman.

The citation said "Curtis Wilson, with due regard for the advantages of fundamental and broad academic experience, received his training at Montana School of Mines, Columbia University, and the University of Goettingen. Eminence in his field of metallurgical engineering followed while occupying the chair of Professor of Metallurgical Engineering at Montana School of Mines at Butte.

"Since 1941 he has held the position of Dean of the Missouri School of Mines and Metallurgy. This institution, under his direction, has made secure its position as one of the finest educational institutions of its kind in America."

The author of the book "Metallurgy of Copper," Wilson is a member of the American Institute of Mining and Metallurgical Engineers, the American Mining Congress, the American Society of Engineering Education, the Pan-American Institute of Mining and Geology, the Mining and Metallurgical Society of American and other professional groups.

Others who received honorary degrees at the ceremony were Charles Malik, Lebanese Ambassador to the U. S.; Hodding Carter, editor and publisher of the Delta *Democrat-Times*, Greenville, Miss., and J. Lionberger Davis, St. Louis civic and cultural leader.

CORRECTION

On page 47 of the September issue of Mining Congress Journal in the description of MINE C, the sentence reading, "The continuous machine loads into a shuttle car . . ." should be corrected to read as follows:

"The continuous machine dumps the coal onto the mine floor and a pickup mechanical loader puts it into a shuttle car for transport to 5-ton mine cars."

FORWARD!

by

LUBRIPLATE LUBRICANTS

The introduction of LUBRIPLATE Lubricants established a new high standard for industrial lubrication. Now, a recently patented improvement in the production of LUBRIPLATE results in even greater lubrication efficiency. Under today's operating costs, reduction of down time, less parts wear and replacements, as well as lower power consumption, far outweigh any differential in the initial cost of LUBRIPLATE Lubricants.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Write for your free copy of the new and enlarged LUBRIPLATE DATA BOOK—a most valuable treatise on modern lubrication!

LUBRIPLATE DIVISION
Fiske Brothers Refining Co.
Newark 5, N. J. • Toledo 5, Ohio

Suspend Work at Portage

Temporary suspension of operation at the Portage Mine No. 2 of the Johnstown Coal & Coke Co. have been announced by the company. The closing of the Portage, Pa., operation is reportedly the result of a lag in general economic conditions in the coal fields.

Open Lithium Deposits

Herbert W. Rogers, president of Lithium Corp. of America, Inc. announced recently the consummation of an agreement with Quebec Lithium Corp., a subsidiary of Sullivan Consolidated Mines Ltd. which will result in increased production of lithium.

Quebec Lithium Corp. owns an important ore body, 25 miles from Val d'Or, Quebec, easily accessible to transportation and utilities. The Canadian company plans immediately the erection of a concentrating plant to produce ore concentrates. Under the agreement just concluded between the two companies Lithium Corp. of America, Inc. will process the entire output of this concentrating mill at its two chemical plants at St. Louis Park, Minn., and Bessemer City, N. C.

As a result of the conclusion of this agreement Lithium Corp. of America, Inc. will be enabled to approximately double the output of its plants. This move follows Lithium Corp.'s announcement several months ago of its plans to erect a $7,000,000 plant at Bessemer City, N. C.

Franklin Mine Closes

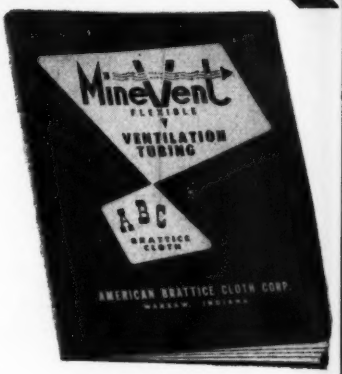
Early this year the New Jersey Zinc Co. announced in its annual report that production at its Franklin Mine in Franklin, N. J., was tapering off and that the last ore would be mined in 1954. Termination of the Franklin operation, it said, would include abandonment of all mine and plant facilities there.

Records show that the existence of the Sterling ore deposit, about three miles from Franklin, was known as early as 1640 and that the Franklin deposit was known before 1750. At both deposits about 160 different minerals have been identified—of these only zincite, willemite and franklinite are of economic importance. Franklinite has never been found in any other locality. Ore was first mined in Franklin about 1848.

According to a recent news item, the Franklin Mine closed down on October 1. Loss of production from this mine will be compensated by output from new mines in preparation and increased production from other mines already in operation.

At the same time, the company announced its intention of trying to attract another industry to Franklin, which has been dependent upon the mine for many decades, and said that it would cooperate with the Borough officials and the local Industrial Commission in getting its surface plant in shape for possible use by others.

The Whole Story is Here for You!



20 Pages of
FACTS · FIGURES · PICTURES

MineVent Flexible Ventilation Tubing

How it is made and used, why it is better, sizes, friction loss charts.

ABC Powder Bags

How they are made, capacities, etc.

ABC Brattice Cloth

7 types described. How it is produced, sizes, etc.

ABC Inflatable Brattice

For fast stoppings in metal or coal mines. How to use them, sizes, etc.

SEND FOR *YOUR* COPY TODAY!

A B C AMERICAN BRATTICE CLOTH CORP.
WARSAW, INDIANA

Main Office and Plant:
310 S. Buffalo Street

P&R Sells Silt Banks

The Philadelphia and Reading Coal and Iron Co. has sold an estimated 2,000,000 tons of raw material from its silt banks. Under the sales agreement, P and R will sell the fuel recovered from the processing of the silt banks.

Philadelphia and Reading Coal and Iron Co. operates anthracite mines in northeastern Pennsylvania.

Find Off-Shore Sulphur

Humble Oil and Refining Co. has discovered an underground sulphur deposit about six miles off-shore from Grand Isle, La. No indication of the size of the find has been given. A company spokesman reports Humble has agreed with the Department of Interior to drill 20 core test holes in two years to measure the extent of the deposit.

Little Sister Coal

(Continued from page 28)

grading land disturbed before the present program was inaugurated. When, in either pit, overburden decreases to a point where the dragline is not needed to assist the shovel in stripping, it also is used to grade old worked-out areas.

Lakes Valuable

Abandoned haulage roads and final cuts have filled with water and formed five miles of lake, covering 70 acres, on disturbed land. All have been stocked with fish after grading is completed. Bass and Blue Gills make up the bulk of fish stocked. However, an experimental planting of Walleye Pike has been made in one of the deeper lakes. Fishing is allowed on the property by permit only, and in designated areas. Swimming is prohibited though, because of the water's depth and the steepness of the banks.

The lakes fill another very utilitarian purpose. One serves directly as a source of water for the coal cleaning plant. Since all lakes are interconnected by pipe line and pump, the washer has the equivalent of a 70-acre water reservoir. Water from the lakes is also used for stock feeding and irrigation.

The lakes are adjacent to the pastures — in some cases surrounding them on three sides—and separated from them by a fence. Fencing materially reduces the graded land available for pasture. However, the land next to the water is being put to very good use; it is being developed into a wildlife refuge. Many different kinds of trees, bushes, shrubs and vines suitable for wildlife food and cover have been planted. Actually, fences are designed to keep cattle out of these areas rather than in the pastures, although they also serve the latter purpose. Multiflora roses have been planted along existing fence lines to replace the wire fence in the future with a living fence.

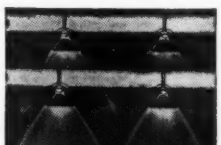
Wildlife activity has resulted in a cooperative project between the coal company and the Illinois Natural History Survey designed to study the development and use of such land for wildlife habitat in Illinois. A man trained in wildlife management has been employed by the coal company to supervise its wildlife work.

The program at Little Sister is under the direction of William H. Cooke, president of the company. Joe Guyton is in charge of the coal mining operations and Francis Platt heads up the farm organization. E. E. Filer is the man in charge of wildlife management. The efforts and cooperation of these men have paid off in an efficient rehabilitation program which has become an integral part of the mining operation. The attitude of management is that mining is not complete until the disturbed land has been returned to productivity. They have the natural conditions to do an impressive job of reclamation—and the job they are doing is impressive.

THE Leahy HEAVY DUTY
NO BLIND VIBRATING SCREEN

Here Is Fine Mesh Screening At Its Versatile Best

For efficient fine mesh screening to satisfy constant or variable demands, the Leahy No-Blind Vibrating Screen is unexcelled.
It screens wet or dry, and by adding the FlexElex jacket heating unit it handles difficult damp fines on full capacity schedules.
When screening at different mesh size is required, the Leahy screen jacket is usually changed in a matter of five or ten minutes.
Whatever its assignment, the Leahy operates economically, and at top efficiency. Send for Bulletin 15-J.



CONCENCO Spray Nozzles

These handy nozzles are simple, flexible and economical. They are removed or replaced in a moment's time. One drilled hole in the spray line permits quick clamping assembly for the best washing, sluicing or spraying you require. Removal and replacement is possible in a moment's time, with perfect alignment and leakless connections always assured.

THE DEISTER★ CONCENTRATOR COMPANY
CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company* ★ *Inc. 1906*
917 Glasgow Ave. • Fort Wayne, Ind., U.S.A.

that keeps them on the go!

Trouble-free operation, unequalled service life and economy per year of operation have always distinguished EDISON battery power in mine haulage equipment. Because of their steel cell construction, alkaline electrolyte, and an electrochemical principle which is free from self-destructive reactions . . . EDISONS give you the *most failure-free, uninterrupted haulage power* that's possible to obtain!

Ideally suited for mine service, EDISON batteries require no critical charge-rate adjustment, can often be charged directly from d-c lines. And, they can be fully re-charged in six to seven hours, are not harmed by accidental short-circuiting, or reverse charging . . . by freezing or standing idle during shutdowns.

For lowest over-all battery costs, be sure to get all of the facts and latest quotations on EDISON batteries as applied to your operations. For an EDISON field engineer's call or a copy of Bulletin 3826, simply write Edison Storage Battery Division, Thomas A. Edison, Incorporated, West Orange, New Jersey.

Most dependable power... lowest over-all cost you get both with an EDISON

EDISON

Nickel • Iron • Alkaline

STORAGE BATTERIES

EDISON ALSO MAKES THE FAMOUS "V.P." VOICEWRITER AND THE TELEVOICE SYSTEM

Brass Company Scholarship

A scholarship program to assist students interested in the technical sciences has been announced by the Ohio Brass Foundation, a non-profit organization established by The Ohio Brass Co., Mansfield, Ohio.

Scholarships will be awarded on a competitive basis to students from its plant areas who plan to seek a degree in chemistry, industrial chemistry, or chemical, metallurgical, ceramic, electrical, mechanical or industrial engineering.

Scholarships cover all tuition and academic fees as well as up to one-half the amount of normal board and room expense and will extend for a four or five-year period depending upon the length of the course chosen. Successful applicants may attend any accredited college of their choice in the United States.

The announcement of this program stated that, "Ohio Brass has been built around ideas and methods developed by engineers, therefore it seemed fitting to the trustees of Ohio Brass Foundation to encourage engineering education and to offer this form of assistance to technically minded students."

Model Mine

A model anthracite mine, complete in every detail from underground mining to a modern breaker and retail scale, has been installed in "Roadside America" by The Philadelphia and Reading Coal and Iron Co.

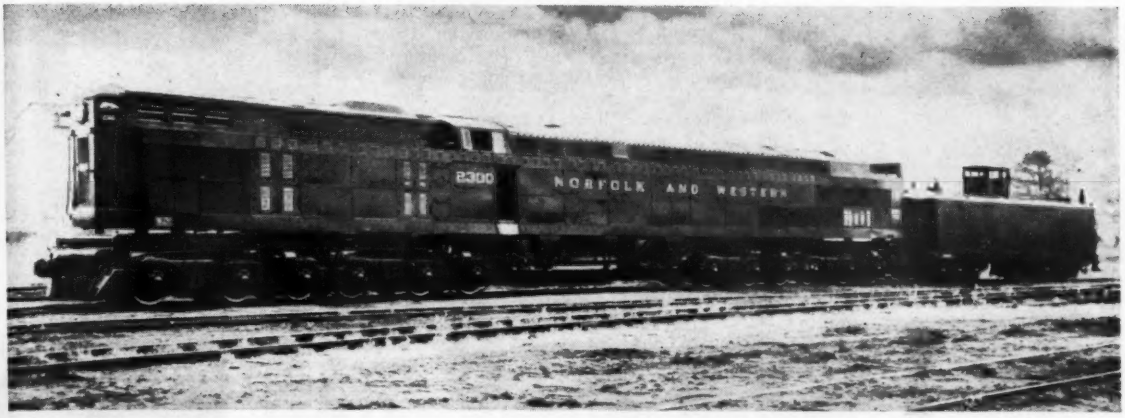
"Roadside America" is a world-famous scale model reproduction of American community life located on U. S. Route 22 between Allentown and Harrisburg, Pa.

The mining project required more than a year to complete and is built to a scale of 3/16 in. The company's Locust Summit Breaker, largest in the world, is reproduced in minute detail, as are the rotary car dump; the surface cleaner plant; office building; retail weigh scales; water tower; and engine house.

The mine shaft, with timbers cut to scale, is sunk into a hillside from which "the cover" has been removed to expose a cross-section of coal veins and a miniature mine with both pitch and flat mining. A model electric mine locomotive hauls miniature cars through the gangway. Lilliputian miners are seen in the manways and other portions of the mine.

The project was designed and constructed by P & R staff members, including Robert C. Bader, P & R advertising artist and draftsman who made the scale drawings and specifications; Jess Bickel, a patternmaker at the company's Potts Colliery who did the actual construction of the mine shaft, surface buildings and breaker; and Harry Reh, mining engineer, who did the detail work on the mine portion.

Experimental Coal Burner

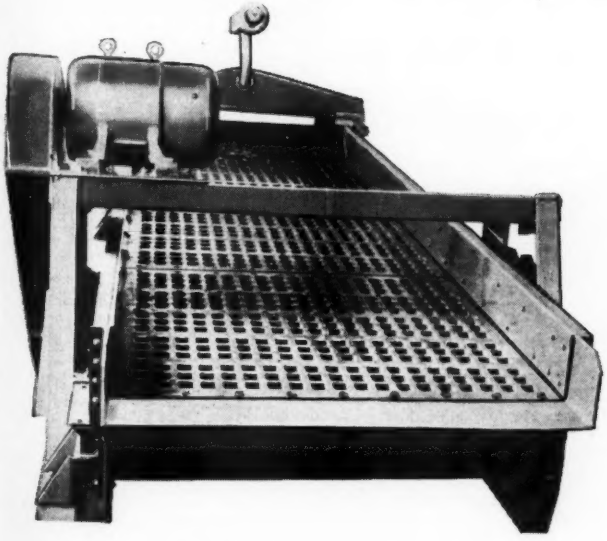


The Norfolk & Western steam turbine locomotive is slightly over 161 ft long and weighs 586 tons complete with fuel and water. Designed for a maximum speed of 60 mph, the unit is capable of exerting a maximum tractive effort of 175,000 lbs and a continuous tractive effort of 144,000 lb at nine mph

Railroad operators will follow with considerable interest the performance of the Norfolk and Western's new experimental coal-burning, steam turbine-electric drive locomotive which was delivered May 19. Rated at 4500 hp, the Baldwin-Westinghouse unit incorporates a Babcock & Wilcox high-pressure water tube boiler with Westinghouse steam turbine and electric drive.

This steam locomotive embodies the best designs from modern stationary and marine power plant practice that can be adapted to the restricted space and requirements of railroad service. It is designed to utilize coal and operates at about double the efficiency of the average coal-burning reciprocating steam locomotive. Its economy in comparison with the diesel-electric depends upon the relative costs of coal and diesel fuel oil at the location where the fuel is used. Within coal-producing industrial areas it can compete favorably with diesel-electric powered locomotives.

Takes rough treatment in its stride



Hendrick Perforated Metal Plate takes the knocks and bruises of constant heavy-duty screening without altering uniformity of material. Because the holes can not stretch, Hendrick Perforated Plate assures large quantity screening without expensive, time-wasting blinding. Supplied either flat or corrugated, Hendrick Perforated Metal is available in any desired shape and size of openings in high carbon, stainless steels and in other commercially rolled metals.

Write for further details— or phone Hendrick direct.

SEE OUR CATALOG IN SWEET'S

Hendrick
MANUFACTURING COMPANY
62 DUNDAFF STREET, CARBONDALE, PA.
Sales Offices in Principal Cities

Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrips

Warden Closed

Warden mine of the Pittsburgh Consolidation Coal Co., Suttersville, Pa., has been permanently closed down. The company reports that the shutdown was due to a combination of poor market conditions and near-exhaustion of coal reserves.

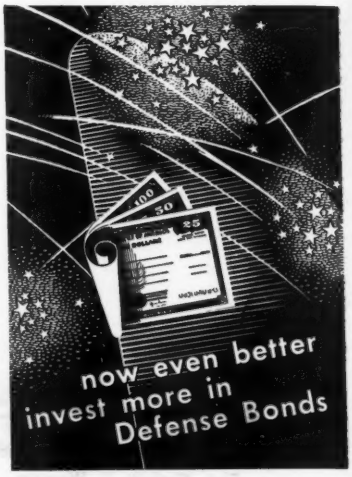
Last year 291,411 tons of metallurgical coal were mined at Warden. Since its opening in 1926, a total of 20,000,000 tons had been mined.

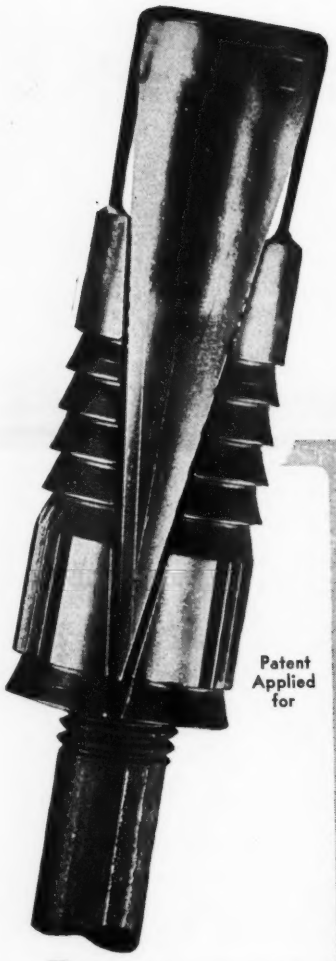
A Tall Stack

Steadily stretching skyward near Copper Cliff, Ont., in the heart of the world's nickel industry is a new signpost of Canada's industrial progress.

Soaring 615 ft above a base 22 ft high, the chimney for the iron ore plant of The International Nickel Co. of Canada, Ltd., will take the title of "tallest in the British Commonwealth" which for many years has been held jointly by the two 500-ft stacks at Inco's Copper Cliff smelter. The great height of the new chimney is expected to ensure proper diffusion of waste gases in the upper atmosphere.

The British Commonwealth's new "champion" chimney is being built of reinforced concrete lined throughout with special brick, and will weigh 17,000 tons. It will contain over 500,000 lb of reinforcing steel and nearly 100,000 lb of insulating material. The stainless steel coping for the top of the shell will weigh 9000 lb. Inside diameter at the top will be 30 ft, and outside diameter at the base will be 63 ft 3 in. The stack will be completed about the end of the year.





7 Advantages of the
PATTIN EXPANSION SHELL
For Roof Bolting

which have brought it so quickly into high demand

1—Double the usual shell expansion.
2—A 3-inch parallel contact with the hole.
3—No definite drilling depth required.
4—Shell can be anchored solidly any place in the hole.
5—Will not turn while being tightened.
6—No loss of parts as wedge and shell are locked together.
7—No special nuts or ears are needed on the bolts.

Our engineers are available for consultation and demonstration. Write or phone us—we'll gladly work with you on any present or future bolting program.

PATTIN
MFG. COMPANY
Marietta, Ohio
Est. 1888

get more earning power with...

Greensburg storage battery locomotives

5 TON HIGH TYPE MONITOR

Available in 3 to 12 tons: 42 to 48" high, 18 to 56½" track gauges.

Greensburg's dependable performance results in operating economy. **Advanced engineering design** and **custom-building** to specifications give Greensburg Locomotives up to 20% more efficiency and longer battery life than any other storage battery locomotive of equal weight and battery capacity. More earning power per dollar invested!

Built in single or double motor drives with double equalizers, drum or contactor type controllers, with or without dynamic braking, Greensburg Locomotives will haul more and cost less to operate!

Send us your haulage problem today!

GREENSBURG MACHINE CO.
112 Stanton St.
GREENSBURG, PA.

Reclamation in Ohio

A. L. Sorensen, chief of Ohio's Agriculture Department, recently reported that miners in his state have done a big job of reforestation—although some strip land has not yet been reclaimed.

Sorensen quoted figures showing that the strip miners planted about 4,000,000 trees last spring on 4787 acres of mined land. They also planted 4665 acres of forage crops.

Since Ohio's strip mine law went into effect January 1, 1948, 17,300,000 trees have been planted on 17,114 stripped acres.

Field Day at Richard Mine

The Colorado Fuel and Iron Corp's Richard Ore Mine, Wharton, N. J., recently held an annual field day in honor of F. Ward Coburn, retired president of the Richard Ore Co., and Fordyce Coburn, manager of the Eastern District of CF&I.

Highlighting the event was the presentation of the Joseph A. Holmes Safety Award to the Richard Ore Mine by Douglas Platt, Chief of the Albany Division of the U. S. Bureau of Mines. The award was accepted by F. Ward Coburn, in the absence of Fordyce Coburn.

Martin J. Brophy, plant manager of the Richard Ore Mine, made the welcoming address, praising members of the Richard Ore Mine Employes' Union, Inc., the people of the community, and officials of the Colorado Fuel and Iron Corp. for their great cooperation and interest in mine safety. He also stated that the safety program was a matter of outstanding importance, and that the sincere efforts of everyone connected with the Richard Ore Mine were reflected in the winning of the safety award.

FLEXCO®

BELT FASTENERS and RIP PLATES

FOR HEAVY CONVEYOR AND ELEVATOR BELTS OF ANY WIDTH

Compression Grip distributes strain over whole plate area

★ FLEXCO Fasteners make tight butt joints of great strength and durability.
★ Trough naturally, operate smoothly through take-up pulleys.
★ Distribute pull or tension uniformly.
★ Made of Steel, "Monel," "Everdur." Also "Promal" top plates.
★ FLEXCO Rip Plates are for bridging soft spots and FLEXCO Fasteners for patching or joining clean straight rips.

Order From Your Supply House. Ask for Bulletin F-100

FLEXIBLE STEEL LACING CO.
4675 Lexington St., Chicago 44, Ill.

Want to Reduce Drilling Costs?
then specify
"Hard Vector Oriented"

DIAMOND BITS by HOFFMAN BROS.

Rigid laboratory and field tests prove that Hoffman Oriented Diamond Core Bits reduce drilling costs. They cut faster—last longer—and have a lower power ratio per foot than ordinary diamond bits. Extra savings are possible on most drilling jobs because each diamond in a Hoffman Oriented Bit is scientifically set to bring out its hardest, sharpest cutting edge.

Orienting drill bort (industrial diamonds) into the crowns of core bits by Hoffman Bros. is based directly upon findings made by the U. S. Bureau of Mines.

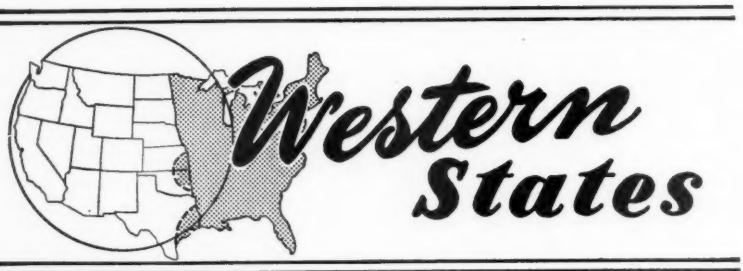
CONTRACT DRILLERS FOR 50 YEARS

Contracting both coal and mineral test drilling since 1902. Hoffman Bros. are completely equipped to save you time and money on your next diamond drilling job. Investigate the savings possible on test drilling for coal, ore and foundations. Free estimates.

Don't forget to ask for complete information on Hoffman Oriented Diamond Bits.

HOFFMAN BROS. DRILLING CO., Inc.

TIONA STREET (Ext.) PUNXSUTAWNEY, PA.



New Kiln Planned

Installation of a new kiln is planned by the Arizona Portland Cement Co. at its Rillito, Ariz. plant. Expected to be in operation by October 1955, the new kiln will increase production from 4000 to 7000 bbl of cement daily.

Tungsten Hunt Pressed

Sloan & Kingaard are progressing with their tungsten exploration in the Searchlight area of the Bald Mining district near Elko, Pine County, Nev. Supplementing the core drilling program, test shipments of surface mined ore have been made to the custom concentrators of Getchell Mine and Cherry Creek for determining mill grade and suitability to gravity-flotation acid recovery.

Explore Hypotheek Find

Exploration work has been resumed by the Hypotheek Mining & Milling Co. at its East Hypotheek property on Pine Creek in Shoshone County, Idaho. Additional diamond drill work from the north surface tunnel got under way in mid-June. The first hole was to be run northeasterly at a 30° angle downward to intersect the downward extension of a strong vein structure exposed by surface exploration work a short distance north of the adit.

Sulphur in Mexico

The Mexican government has granted Texas International Sulphur Co. a 90-day extension of its September 7, 1954, deadline for selecting 16,818 additional acres for sulphur exploration in the Isthmus of Tehuantepec, State of Veracruz.

Granting of the extension gives Texas International until December 7, 1954, to locate and claim the additional properties in the Mexican national reserve in Tehuantepec, where the company already holds exploratory rights to 196,732 acres.

Texas International's exploration progress in the Isthmus of Tehuantepec, where it has already definitely defined three salt domes on its concessions and is now engaged in core drilling for sulphur on those locations, resulted in the granting of the extension, Victor Dykes of Houston, president of the sulphur company, announced.

Under its contract with the Mexican government, Texas International has been granted exploratory rights in Tehuantepec to 123,550 acres in an area where three other companies have already found sulphur in sufficient commercial quantities to warrant construction of multi-million dollar Frasch plants. Of the 123,550 acres, a total of 106,732 has already been located and awarded to Texas International by the Mexican government.

The contract originally stipulated that the 16,818 additional acres must be selected prior to September 7, 1954. The deadline has now been extended to December 7, 1954.

Apache Mines Bought

Sun Valley Mining Corp., a Delaware corporation, has taken over the Blaine County properties of the old Apache Mines Co. Properties include the Red Elephant, the Bay State and the Valley View mines west of Hailey, all the Tug Wilson estate and numerous other claims, together with the Apache mill on Bullion gulch.

Uranium Plant to be Enlarged

Anaconda Copper Mining Co. will expand its uranium processing plant at Bluewater near Grants, N. M., according to a joint announcement by the Atomic Energy Commission and the Anaconda Copper Mining Co. "Construction of the expanded plant facilities will start right away and should be completed in about 18 months," said Sheldon P. Wimpfen, manager of the AEC's Grand Junction Operations Office.

The expansion program was announced only a few months after the opening of the original Bluewater plant. The expansion will consist of two parts:

(1) Facilities for the treatment of limestone gangue ores of the Todilto formation by a carbonate leaching process will be enlarged.

Why Search for
URANIUM
with a Horse and Buggy?

THE
New ROYAL SCINTILLATOR

★ Is more sensitive than any other Scintillator or Geiger Counter
★ Easily detects *deeply* buried Uranium deposits from ground or air
★ Produces results never before possible
★ Can be used for oil field surveys
★ Made by the manufacturers of the famous "Scintillator"

Dealers Wanted

Contact your nearest dealer or write direct for complete catalog of Geiger Counters, Scintillators and metal locators including the new "Special Scintillator" priced at only $299.50.

PRECISION RADIATION INSTRUMENTS, INC.
2235 M-JS So. La Brea Ave., Los Angeles 16, Calif.
Please send Free Catalog.
NAME_____TITLE_____
COMPANY_____
ADDRESS_____
CITY_____ZONE___STATE_____

WORLD'S LARGEST MANUFACTURERS OF PORTABLE RADIATION INSTRUMENTS

(2) An addition to the present plant will be constructed to treat sandstone gangue ores by an acid leaching process.

Anaconda will buy sandstone gangue ores for stockpiling pending completion of the new facilities. Wimpfen said he expects the expansion program to stimplate uranium mining operations in the area.

The Sheet-Mica Industry

(Continued from page 62)

(thins) is divided into the following two groups:

Thins 0.002 to 0.004 in.

Thick thins 0.004 to 0.007 in.

Why these two groups were introduced is somewhat of a mystery, since the A. S. T. M. definition of film includes the same range of thicknesses. Certainly the term "thick thin" is about as contradictory as describing a single color as "black white."

Mica block and film, as defined by the A. S. T. M., appear to be good terms, but the latter could be extended to include thins. The consumer needs only to specify quality and range of thickness desired. The terms thins and thick thins however, might well be stricken out.

Splittings are recognized throughout the mica industry as thin laminae of various sizes and qualities used in the manufacture of built-up mica products. There is no need to change this term.

Modernization A Must

The sheet-mica industry is unique in many respects. From the time the material is mined until it is ready for fabrication, primitive methods are still used.

When it comes to manufacturing built-up mica and fabricating finished mica parts, however, mass production, with modern machinery, is practiced.

As long as the present low wage scale prevails in India, where the bulk of sheet mica is produced, there is little incentive to develop our domestic mica deposits or to replace the hand labor employed in processing by mechanized equipment.

Nevertheless, the strategic nature of mica and the essential role it plays in the electronic industry have created economic and practical problems that should be intensively studied.

Much of the present mica terminology is highly involved and badly in need of simplification. This is due partly to the reluctance of the industry to dispense with old and outmoded terms while introducing new ones and partly to the fact that the various qualities of mica are largely determined by describing their visual characteristics in vague and confusing terms.

Preliminary visual examination will always be necessary in the mica industry, since it enables the miner and processor quickly to discard mica that is definitely unusuable. On the other hand, the determination of mica qualities by distinguishing slight differences in visible imperfections places too much dependence on individual judgment.

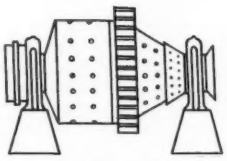
A scientific and rapid method of determining the electrical properties of sheet mica and automatically separating it into various sizes and qualities according to its suitability for specific end uses would eliminate a number of laborious and inadequate processing steps. Moreover, such a development would render unnecessary many vague and confusing terms now used to describe the nature and types of impurities that presumably affect mica quality.

A concerted effort along these lines by both producers and consumers can do much toward simplifying our mica terminology, establishing mica standards on which we can depend, and insuring better utilization of the world's mica resources.

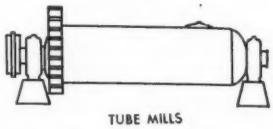
CF&I

grinding balls

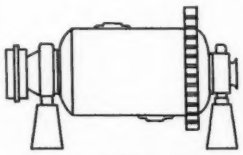
best for any type of mill



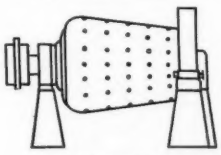
CONICAL MILLS



TUBE MILLS



CYLINDRICAL MILLS



TRICONE MILLS

When you use CF&I Grinding Balls you'll get even wear, resistance to impact and high through-put. Special treatment and controlled analysis steel assure high hardness rating with the necessary toughness to give maximum service in all sizes and types of grinding mills operating at either high or low speeds.

CF&I Grinding Balls are carefully forged and inspected to assure long life—are free of surface pits, circumferential ridges and other surface unevenness.

CF&I PRODUCTS FOR THE MINING INDUSTRY

Cal-Wic Wire Cloth Screens • Mine Rails and Accessories
Wickwire Rope • Rock Bolts • Grinding Balls
Grinding Rods

CF&I FORGED STEEL GRINDING BALLS
THE COLORADO FUEL AND IRON CORPORATION

2540

Albuquerque • Amarillo • Atlanta • Billings • Boise • Boston • Buffalo • Butte • Casper • Chicago
Denver • Detroit • El Paso • Ft. Worth • Houston • Lincoln (Neb.) • Los Angeles • New Orleans • New York
Oakland • Oklahoma City • Philadelphia • Phoenix • Portland • Pueblo • Salt Lake City • San Antonio
San Francisco • Seattle • Spokane • Wichita • CANADIAN REPRESENTATIVES AT: Calgary
Edmonton • Montreal • Toronto • Vancouver • Winnipeg

FOR SUPERIOR RESISTANCE to ABRASION and CORROSION

Specify

STRATOFLEX

FLEXIBLE HOSE No 225

Built to give long service where conditions are especially rough on hose lines. Reinforced with high tensile strength wire braid with outer cover of tough synthetic rubber. In bulk Hose or Hose Assemblies with Stratoflex "over the cover" detachable, re-usable fittings. Write for your FREE catalog or order through your dealer.

★Hose Assemblies

★Re-usable Hose Fittings

Dealership Available in Some Areas

STRATOFLEX

STRATOFLEX, Inc. FORT WORTH, TEXAS
P. O. Box 10398
General Offices—P. O. Box 10398
Fort Worth, Texas
Branch Plants—Los Angeles and Toronto
Sales Offices—Atlanta, Chicago, Dayton, Houston, Kansas City, Los Angeles, Portland, New York, Toronto, Tulsa

Uranium Production Reaches Record Proportions

THE Atomic Energy Commission took official note of the uranium boom in the West in its Sixteenth Semi-Annual Report to Congress. The Colorado Plateau remains "the most important source of domestic uranium production" and the "domestic uranium mining industry was at its highest state of activity to date as exploration for and production of uranium on the Colorado Plateau reached record proportions."

AEC noted that "nearly all the large ore bodies discovered in the past two years are located on the Colorado Plateau," and, "at one time there were only four known uranium deposits in excess of 100,000 tons of ore reserves." "Now there are at least 15 such large ore bodies and several of these greatly exceed 100,000 tons," the report continued. The AEC said discovery of several large ore bodies "has created a need for additional ore processing facilities on the Colorado Plateau." Ore reserves are now at an all-time high and ore production is expected to exceed the present level of production during the next few years."

Need for more processing facilities will be met, the report said, through construction of new mills and expansion of exisiting facilities. The AEC said the Climax Uranium Co., which operates an ore processing mill in Grand Junction, Colo., is among those considering expansion. Expansion also is planned by Vanadium Corp. of America, which operates mills at Rifle and Durango, Colo., and Vitro Uranium Co., which has a mill in Salt Lake City.

Work already has begun on added facilities at the Anaconda Copper Mining Co. mill at Bluewater near Grants, N. M. A new mill is being built at Shiprock, N. M., by Kerr-McGee Oil Industries, Inc. This mill is expected to be completed late this year, bringing to nine the number of processing mills in operation on the Colorado Plateau. Additional new mills are planned at Moab, Utah, to treat the ores of the Big Indian Wash District near Bedrock, Colo., to treat the ore from the Jo Dandy ore body; and at White Canyon or Hite, Utah, to treat the White Canyon ores.

The AEC also plans to expand its mill at Monticello, Utah, operated by the Galigher Co. in order to treat the several types of ore mined in that region.

It was noted that intensive exploration had expanded the producing horizons from one or two principal formations to a number of formations. The principal formation has and continues to be the Salt Wash member of the Morrison formation.

. Another formation which continues to be a major producer is the Shinarump. The Commission noted, "other important producing formations include the Chinle and Moenkopi in the Monument Valley, White Canyon, Green River Desert, Big Indian Wash, and San Rafael Swell areas of Arizona and Utah; and the Todilto limestone of the Zuni and Lucero Uplift between Albuquerque and Gallup, N. M." Other producing horizons include the vanadium ores with uranium by-product produced from the Entrada formation in the Rifle, Placerville and Rico, Colo., areas.

AEC reported that by May 1, some 430 mining operators were producing and delivering uranium ores from 530 mines in the U. S. with the Colorado Plateau the principal source. Nearly all of the important large ore bodies found in the past two years have been in that area. Uranium mineralization is now known to exist in at least 18 different stratigraphic formations.

The report also cited the Marysvale, Utah, district as still the only important source of primary vein-type production, although deposits of this type occur throughout the Rocky Mountain area, in particular in the Boulder Batholith area of Montana and the Colorado Front Range. It was pointed out that there was some uranium production in South Dakota, Wyoming, Montana, Arizona, California, and Nevada. Special mention was given to the fact that uranium production is planned by the Lehigh Coal and Navigation Co. at its Mauch Chunk, Pa., properties.

Construction of several new ore buying stations was also noted. A provisional ore buying station was set up at Moab, Utah, in May to provide a market for ores produced in the Big Indian Wash area, while a new crushing and sampling plant, to be completed later this year is under construction. Construction was also started in June on an ore-buying station in White Canyon, 15 miles east of Hite, Utah. The stations will be operated for the Commission by the American Smelting and Refining Co., which also operates several other Commission ore-buying stations.

Interest in prospecting for uranium increased significantly, being stimulated by the recent discoveries of large ore bodies. Many large and long-established mining companies showed greater interest in this strategic material and entered the uranium mining industry, according to the AEC. "With the advent of large mines, uranium mining is becoming more stable and modern, large tonnage methods are coming into wider use," the Commission said.

Exploration activities also reached an all-time high during the first six months of 1954. Government agencies drilled some 500,000 ft of holes in the search for uranium, with an additional 500,000 feet estimated to have been drilled by private interests. Airborne exploration was increased. Government and private planes flew an estimated 200,000 miles seeking radioactivity with sensitive instruments like the scintillation counter.

Commenting on its bonus award program, the Commission pointed out that over $3,600,000 has been paid out as bonuses on the production of the first 10,000 lb of uranium oxide contained in ore produced from the new uranium mines on the Plateau. These payments have been made to 379 certified mining properties, 64 of whom have received the full benefits provided under the bonus program.

The report also noted that the third and fourth plants for the by-product recovery of uranium from the Florida phosphate rock were completed by the International Minerals and Chemical Corp. at Bartow, Fla., and by the Virginia-Carolina Chemical Corp. at Nichols, Fla. It was expected that continuous production would be initiated shortly. Several other recovery plants are in various stages of negotiation, the Commission pointed out.

While pointing to greatly stepped up domestic production, the Commission said that foreign sources "continued to provide substantial quantities of the raw material needed for the atomic energy program." The report said that uranium receipts from South Africa "reached important proportions" since the start of the production program there in October 1952. A sixth new production plant went into production there in February, the AEC said, "and several additional new plants are scheduled for completion and initial operation later this year."

Production and exploration activities are increasing in Australia while in Canada "a substantial expansion program is planned for completion late this year" at a busy uranium mill in the Lake Athabaska region of Saskatchewan.

Change Mining Method

Plans for a new underground mining system at its Crestmore, Calif., limestone mine have been announced by the Riverside Cement Co. The new system will replace the former block caving system used there. It is expected to be put into operation this fall. When completed, limestone will be mined from a series of rooms 200 by 50 by 90 ft in size which will be mined in three 30-ft. benches. Electric shovels will load the limestone into diesel-powered trucks.

In the largest underground mine in the United States, over 70% of the daily production of 28,000 tons of molybdenum ores—more than half of all the moly this side of the iron curtain—is hauled in Card Granby type cars built to Climax specifications.

These are the largest and heaviest cars of this type we have built . . . designed to withstand unusually rugged loading conditions plus the wear and tear inflicted by a cleanout machine (also a Card product).

CARD car engineering results in large savings to many of the major ore producers of the world with cars built to special order at little more than the cost of standard stock models. CARD engineers are happy to consult on any haulage problem. No obligation.

C.S. Card Iron Works Co.
2501 WEST 16th AVE.,
DENVER, COLORADO

Pass Tecolote Bore Hot Spot

Miners pushing through the 6.4-mile Tecolote Tunnel in southern California had been having a hot time of it for a while. The tunnel is the key element of the Bureau of Reclamation's Cachuma project to bring irrigation water from the Santa Ynez valley through the mountains to the farms in the coastal area near Santa Barbara, Calif.

Contract for driving the seven-ft horseshoe bore (inside finish concrete) was awarded early in 1950. For a while progress was good, but unforeseen quantities and temperatures of ground water (4000 gpm and 112°F) prompted the contractor to close down the job for restudy about a year ago.

Work was resumed last January under a renegotiated contract. Contractors put in air conditioning to cool the air and pumps to remove the hot water. To combat the intense heat, men ride through the hottest part of the tunnel submerged to their necks in water-filled 1¾ yd mine cars. The worst is behind though and the miners report they have reached good quality rock and are moving out of the zone of extreme hot water. Total outflow has dropped from a maximum of 7800 gpm to about 6500 gpm at a temperature of 104°. Crews are encountering hard dense sandstone and are moving away from the fractured rock and its water-bearing seams.

Approximately four-fifths of a mile of tunnel must still be driven to connect with the upstream heading of the tunnel which has been completed.

Open Ore-Buying Station

A new uranium ore-buying station was opened by the U. S. Atomic Energy Commission on October 1, 1954 in the White Canyon area of southeastern Utah. The site of the new ore-receiving and sampling plant is in White Canyon, 15 miles southeast of Hite, Utah.

Employing standard automatic sampling procedures, the new station's equipment includes primary and secondary jaw crushers, a set of rolls, and a third crushing unit, plus a sample grinder and pulverizer. Construction of the buying station was started in June by the Walker-Lybarger Construction Co.

The White Canyon station is operated for the Commission by the American Smelting and Refining Co. Uranium ores delivered to the station will be purchased under the buying schedules in Domestic Uranium Program Circular 5, Revised. Copper-uranium ores and high-lime ores will be purchased in accordance with the schedules for these ores now in effect at the buying station and processing mill at Monticello, Utah. The Commission also will be interested in discussing arrangements for delivery to this station of types of uranium-bearing ores other than those described above.

Prior to the opening of the White Canyon buying station, ores produced by the uranium mines in this important area have been purchased by the Commission at Monticello. Opening of the new station will reduce long ore hauls and encourage the production of ores in this section.

Phosphate Rock

Westvaco Mineral Products Division of the Food Machinery & Chemical Corp. has acquired extensive deposits of high-grade phosphate rock and shale in Rich County, Utah. The Utah tract, well known locally as Jeff's property, is reportedly the last-known large, patented phosphate deposit in the West.

Westvaco currently operates four large electric furnaces at Pocatello for the production of elemental phosphorus from shale rock deposits of the nearby Fort Hall Indian reservation. The new property gives the company two of America's largest unworked phosphate rock and shale deposits.

Wire Rope for all mining equipment by

Macwhyte

You'll save money by using Monarch Whyte Strand Wire Rope specially designed to give long, safe, low-cost service on your mining equipment.

Monarch Whyte Strand wire ropes are PREformed and internally lubricated. For best service, all wires are coated with special lubricant to reduce corrosion and internal friction.

There are a thousand and one ropes made by Macwhyte.

Whatever your wire rope needs, for the right rope call a Macwhyte Distributor or write to:

MACWHYTE COMPANY

2952 Fourteenth Avenue
Kenosha, Wisconsin

Mill Depots: New York Pittsburgh • Chicago • St. Paul Fort Worth • Portland • Seattle San Francisco • Los Angeles Distributors throughout U. S. A.

Macwhyte general catalog G-16 is available on request

10618

Employes Buy Trona Homes

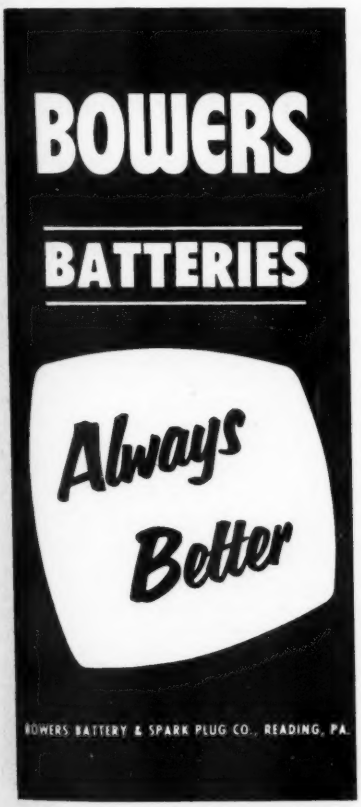
Three hundred and thirty-six residences at Trona, Calif., have been sold to employes of American Potash & Chemical Corp. in just six weeks, according to word from the company's headquarters in Los Angeles.

Trona, approximately 180 miles northeast of Los Angeles, has been a company-owned town since its construction between World Wars I and II.

Every residence offered for sale was purchased by an employe of the company. The only holdings retained by the corporation are the town's business district and residential quarters for unmarried employes.

Prior to the sale, all homes in Trona were rented by the company to its employes. The announcement explained the sale was to permit the corporation to "withdraw from the role of landlord" and confine itself exclusively to the production of chemicals.

With the community's conversion to private ownership, Trona becomes a county service area of San Bernardino County. A service area is a special tax district set up to provide public services such as fire protection, sanitation, street lighting and recreation. To facilitate the changeover, the company donated all existing street lights, fire protection facilities and other public service installations.



The chemical plant at Trona manufactures more than 20 industrial and agricultural chemicals from brine permeating a 30-miles-square dry lake adjoining the town.

Close Gold Mine

The Big Hurrah gold quartz mine, northeast of Nome, Alaska, has had to close down. After much rehabilitation work which led up almost to the point of actual production, serious ground movement and caving in of the shaft forced a closedown of operations. It is reported that another attempt at reopening will be made next spring. The mine is a famous old producer of the early 1900's.

Enough Copper for All Needs

The first of a new series of quarterly reviews of the copper industry issued by the Copper Division, Business and Defense Services Administration, indicates that the red metal "is fortunately in ample supply to meet any foreseeable demand."

According to William A. Meissner, Jr., Deputy Director of the Copper Division of BDSA, all three sources of domestic supply are improving: "Mine production, net imports, and scrap all show promise of substantial increases in both the short and the long term views," he said.

Record Belt Length

A potash mine in Carlsbad, N. M., will soon be equipped with the longest conveyor system in the United States.

Hewitt - Robins, Incorporated, has been awarded a contract by the Potash Company of America to extend the present underground conveyor system at its Carlsbad mine to a total length of approximately 7¼ miles.

The longest conveyor system currently in operation is one in a western Pennsylvania coal mine measuring 5½ miles.

The conveyor system when completed late in 1955 will consist of 45 units linked together to carry the material in a continuous flow from the mining area to the refinery.

Post AEC Information Map

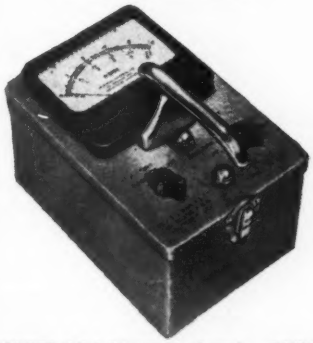
In furtherance of the policy of the U. S. Atomic Energy Commission of publicly releasing information which can be made available to the public, concerning the location of surface areas of high radioactivity that have been found by airborne detection instruments, a temporary posting place will be established at Rawlins, Wyo., for the period in which airborne deconnaissance surveys are being conducted in that area.

On the 15th day of each month, an index map showing locations of anomalous areas in the general vicinity of Rawlins will be posted at noon at the post office in Rawlins.

FIND MORE URANIUM PER $ SPENT

SCINTILLATION COUNTERS

100 Times More Effective Than a Geiger Counter



MODEL SC-8 (pictured above).. $495.00
MODEL 111 ..... 495.00
MODEL 117 ..... 299.50
MODEL 118 ROYAL..... 1,995.00

AIRBORNE SCINTILLATION COUNTERS

SAB-7 OPTIMUM MODEL.... $2,810.00

MODEL SAB-9 ..... $1,250.00
Recorder and Amplifier 500.00
Total $1,750.00
MODEL SAB-11 (Includes 3 in. Crystal with RECORDER).. $2,750.00

GEIGER COUNTERS

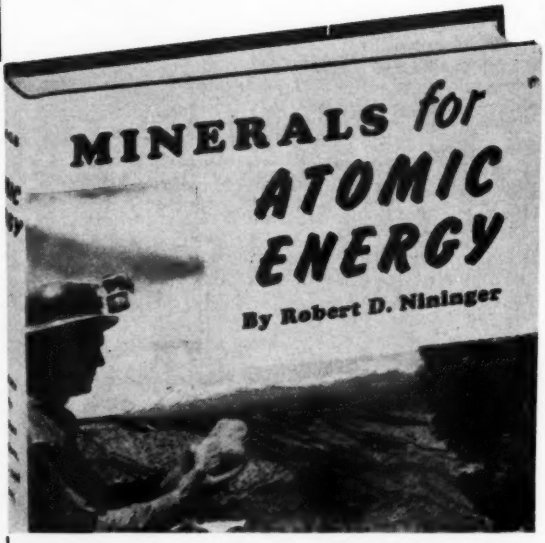
MODEL 106B $99.50
MODEL 107B 139.50

DRILL-HOLE LOGGING

MODEL 120 with 50 ft. probe... $289.50
Extra Cable 25c a ft.
INDUCTO-REEL $1,250.00
With RECORDER 1,650.00

ENGINEERS SYNDICATE, LTD.
5011 Hollywood Blvd.
HOLLYWOOD 27, CALIFORNIA

AUTHORITATIVE GUIDE FOR AMATEUR OR EXPERT TO PROSPECTING FOR ATOMIC MINERALS



MINERALS FOR ATOMIC ENERGY

By Robert D. Nininger
Deputy Assistant Director for Exploration, U. S. Atomic Energy Commission

THE organization of the contents is designed to make the book equally useful to the untrained and the professional geologist or prospector. Part One describes the minerals and mineral deposits that are the sources and potential sources of uranium, thorium and beryllium, with full attention to physical properties and geologic characteristics, together with a careful description of the identifying marks of likely deposits. Part Two is a comprehensive survey of the various areas of the world with respect to their favorability for new deposits of atomic energy minerals with prospecting equipment, and techniques, the use of the Geiger and scintillation counters, evaluation of deposits, and the countless details of prices, markets and governmental controls the prospector must know. Extensive appendices include mineral identification tables, classifications of ore deposits, testing and analysis procedures, lists of equipment suppliers and analysis centers, the laws and regulations controlling propecting here and in the important areas abroad.

Illustrated in color and black and white, 367 pages, $7.50.

at all bookstores, or write

D. VAN NOSTRAND COMPANY, Inc. 250 4th Ave. New York 3, N. Y.

—BOOK REVIEWS—

LEFAX MATHEMATICAL DATA BOOK, LEFAX, *Philadelphia 7, Pa.—334 pages—$2.25.*

THIS looseleaf pocket manual contains tables and formulas for solving problems in arithmetic, geometry, algebra, trigonometry, analytical geometry and calculus. Material is arranged in six thumb-indexed sections for instant reference. It covers mathematical reviews; squares, cubes, square roots, cube roots, reciprocals, areas and circumferences, etc.; 5-place logarithms of numbers; 5-place logs of trig functions; 5-place natural trig functions; and hyperbolic functions.

YEARBOOK OF THE AMERICAN BUREAU OF METAL STATISTICS, *Maple Press Co., York, Pa., 122 pp., $3.00 postpaid.*

COMPILED by the American Bureau of Metal Statistics, 50 Broadway, New York 4, N. Y., the thirty-third annual issue of this useful book is just off the presses. This is the international survey sponsored by leading nonferrous metal producers in the United States and Canada.

It records for 1953 and prior years production figures and other economic statistics on a world-wide basis for 15 of the principal nonferrous metals, together with lists of metallurgical plants and their capacities.

PROSPECTING WITH A COUNTER, *by Robert J. Wright, U. S. Government Printing Office, 68 pp., 30c.*

THIS is a U. S. Atomic Energy Commission booklet describing the use of radiation detection instruments in prospecting for uranium ores. A more detailed discussion of the use of such instruments is presented than is given in "Prospecting For Uranium," the AEC-Geological Survey handbook on uranium prospecting which has been on sale by the Superintendent of Documents since 1949. The two volumes are companion references for uranium prospectors.

Emphasis in the booklet has been placed on practical problems relating to the use of radiation detection.

INTRODUCTION TO MINING, *by Dr. Bohuslav Stoces, D.Sc. Published in the U. S. A. by British Book Center, 122 East 55th St., New York 22, N. Y. Two Volumes, Illustrated, Cloth bound—1078 pages. Price $10.00.*

EVERYONE who has ever tried to teach mining to beginners has dreamed of writing *the* textbook on mining. Dr. Stoces has done it.

The dedication of this book explains in large measure the attitude of the author in preparing this exhaustive treatise. "This book is dedicated to all tyros in the ancient craft of mining with the wish that they may fall in love with mining as much as I did so that any task, however hard and difficult, may be no hardship, but a source of joy and satisfaction."

Dr. Edward Wisser, Professor of Mineral Exploration at the University of California, in a foreword to the book, says, "The function of a university or college is in my opinion to teach basic principles rather than details of practice; the latter are learned in the mines. In Dr. Stoces' manuscript I saw a textbook dealing essentially with fundamental concepts, with the basic principles that lie behind successful use of any individual mining method. Details of mining practice were brought in mainly to illustrate those concepts. Here at last was an exposition of the principles of mining on a level consonant with the spirit and aims of a university rather than with those of a trade school."

After examining "Introduction to Mining" we find we agree with Dr. Wisser.

Manufacturers Forum

Bucyrus-Erie Announces 71-B

A new 3-cu yd shovel—readily convertible to dragline, clamshell or lifting crane—has been developed by Bucyrus-Erie Co., South Milwaukee, Wis., to complement its line of individually designed crane-excavators.

The major features include: positive twin rope crowd with rectangular inside dipper handle; strong light boom; fully independent boom hoist; full air control (not just air assist) except for drum brakes and swing and propel jaw clutches; torque converter drive (also available without torque converter); one-piece cast steel revolving frame; choice of four A-frames; 12 conical hook rollers; four optional crawler mountings, and steering clutches and friction digging brakes spring set and air released.

Portable Uranium Laboratory

As most uranium prospecting is done far from civilization, it is not uncommon for from four to six weeks to elapse before a laboratory report is returned on a sample of ore. To help shorten this interval, the Sherwin Instrument Co., Inc., of 2875 Broadway, New York City, is producing the Uranium Analysis Laboratory designated as Model UA-10. This portable laboratory designed for use by professional and amateur uranium prospectors gives a fast, on the spot, uranium analysis of ore samples.

According to the manufacturer, it requires no chemical or mathematical training on the part of the user and is entirely complete and self-contained. Each uranium analysis, which can be done in 30 min, uses about 75 cents worth of materials.

Housed in a small, compact, rugged, metal case, the apparatus includes: a specially designed optical color comparator, high temperature burner and fuel supply, plus reagents and equipment needed to assay ore samples. Complete detailed instructions are also supplied with the kit.

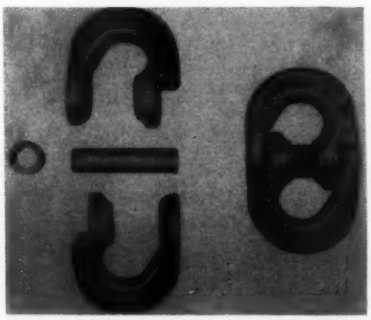
For further information address: Sherwin Instrument Co., 2875 Broadway, New York City.

That's a Lot of Rope

On the afternoon of August 18, the 500,000th mile of wire rope was manufactured by the 97-year old St. Louis concern, Leschen Wire Rope Division of H. K. Porter Co., Inc. Instead of figuring how many times the wire rope would cross the continent or go around the world the Leschen people figure that if their rope were to have encircled the city of St. Louis it would have gone around it more than 12,370 times to make a solid steel fence 515 ft high.

"Spring-Lock" Chain Repair Links

A new product designed to enable dragline operators to repair drag chains with greater speed and ease has been announced by Electric Steel Foundry Co., Portland, Ore. The



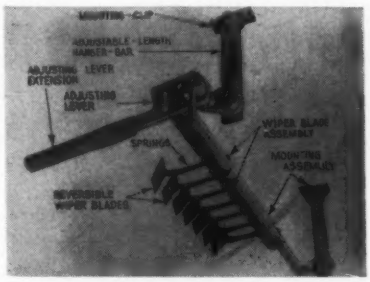
new product consists of a change in the method of locking the link connecting pin in place and is labeled "Spring-Lock" repair link. It is a tightly compressed coil spring that grips the pin, replacing the elliptical collar formerly used.

For further details, write Electric Steel Foundry Co., 2141 N. W. 25th Ave., Portland 10, Ore.

Twist for Conveyor Belt Cleaner

The S-A spring type conveyor belt cleaner is designed to remove material adhering to the belt after discharge, thus helping to prevent cover wear. Steel wiper blades perpendicular to the belt surface, but diagonal to its line of travel, scrape off material, allowing it to fall to the discharge chute. Since the wiper blades are mounted on spring arms, pressure against the belt can be adjusted for different operating conditions.

Formerly, these spring steel arms exposed a flat surface to the dribble falling from the wiper blades, allow-



ing some material to build up on the flat surface. The new belt cleaner design incorporates a twist in the arm so that a vertical edge is exposed to the dribble falling from the wiper blades. This eliminates any build-up on the arms.

For complete details write for bulletin 651. Standard Products Div., Stephens-Adamson Mfg. Co., Aurora, Ill.; Los Angeles, Calif.; Belleville, Ont., Can.

MF Welder Uses New Principle

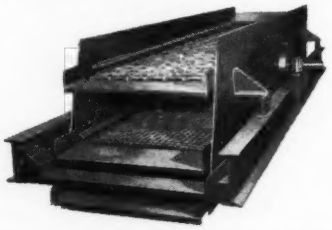
A new, semi-automatic welding machine is now being field tested by the Amsco Division of American Brake Shoe Co. It is said to combine the advantages of hand welding and automatic welding, while eliminating most disadvantages encountered with either method.

Amsco's new machine, called the MF Welder, feeds bare wire through a hand-held hopper containing magnetic flux. Flux clings to the wire as it leaves the hopper because of the magnetic field set up by welding current flowing through the wire. Thus

the electrode wire, which is fed continuously from a coil, reaches the arc with a flux covering that contributes the advantages of a manual electrode coating. The operator can weld steadily for 15 min if desired; the delay of replacing electrodes and the waste of stub ends are eliminated.

Expanded Line of Screens

Bonded Scale and Machine Co., 2176 South Third St., Columbus 7, Ohio, has announced two new expanded lines of vibrating screens. There are 31 models of bonded heavy duty four-



bearing eccentric shaft screens in single and multiple decks. The line of two-bearing, eccentric weight Bonded general purpose screens includes ten models having one, two and three decks. Open, covered and totally enclosed models are available.

Twin Engine Crawler

Euclid Division of General Motors announced its entry into the crawler tractor market recently with a new twin-engine machine. The 53,000-lb

experimental tractor's two diesel engines develop a total of 380 hp.

The Model TC-12 Twin Crawler is the first of a projected line of tractors for earth moving, open pit mining, logging, and industrial applications.

Heavy Storage Racks

Heavy-duty warehouse racks, with shelves nine by four ft are now offered by The Frick-Gallagher Mfg. Co., to increase capacity and orderliness of bulk storage areas. Each shelf carries loads up to two tons, and racks of two or three shelves accommodate large-item storage to ceiling height.

Complete information on F-G-M storage engineering and specialized storage equipment may be had from the manufacturer, The Frick-Gallagher Mfg. Co., Wellston, Ohio.

New Prospector's Hand Drill

A single jack drill that stays sharp much longer than conventional steel drills has recently been developed by Kennametal Inc., Latrobe, Pa., for use in prospecting.

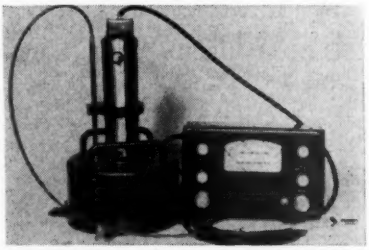
Kennametal prospector's drills are offered in two standard lengths of 18 and 24 in. and for hole sizes of 1¼-in. diam in the 18-in. length and 1⅛-in. diam in the 24-in. length.

It is reported that Kennametal's hand drill will stay sharp 50 to 100 times longer than the steels usually used for similar purposes.

Announce Scintillation Counter

The Radiac Co., Inc., 489 Fifth Ave., New York 17, N. Y., announces the "Ferret," an ultra-sensitive scintillation survey meter for uranium and oil prospecting.

The "Ferret" consists of a Scintillation Detector Head and a Count Rate Meter. The Dectector Head uses an oversize gamma-sensitive crystal, two in. in diam by two in. in thickness, optically connected



to a photomultiplier tube. The Count Rate Meter has six ranges of sensitivity and four variable time constants. This scintillation survey meter, which was developed for Atomic Energy Commission use in making rapid airborne radioactivity surveys, can be used for fast, as well as slow, reconnaissance from a low-flying aircraft or moving vehicle.

Off-Track Track Cleaner

Track cleanup in tipple and hauling areas has been put on a steady production basis by a new, off-track, self-propelled loader produced by Athey Products Corp. Labeled the 125 Hi-

Loader Track Cleaner, its maker claims the versatile rig can load up to 10 cu yds of loose debris from track areas each minute.

A 101-hp engine provides plenty of power for all operations of the 125 Hi-Loader. The cutting edge extends 98 in. across the front of the loader and has tunnels to protect the track and guide the machine. The track cleaner loads at speeds up to 2.0 mph and can move off-track between job assignments at rates up to 20 mph. Big tires permit work across tracks without damage to roadbed or machine. The wide gather enables the track cleaner to clean both between the rails and to the tie ends.

Voltmeter-Ammeter Recorder

A new wide-strip electronic recorder for measuring and recording both current and voltage simultaneously on one chart has just been announced by the Bristol Co., Waterbury 20, Conn. The primary measuring elements of this one-case instrument are a thermal-voltage converter and a thermal-current converter, a-c/d-c transducers.

New ¾-Yard Shovel-Crane

The LS-68, a light ¾-cu yd shovel-crane, is being announced by Link-Belt Speeder Corp.

This new machine replaces the LS-52, in the field since 1952. The LS-68 offers all advanced features, including Speed-o-Matic power hydraulic controls.

Among its important features are a heavy, wide lower frame (11 ft over-all length—nine ft two in. wide

with 24 in. shoes and nine ft eight in. with 30-in. shoes). Large, ten-in. diam, heat-treated forged steel single-flange track rollers are bronze-bushed and mounted on 2½-in. diam shafts.

Weight of the LS-68 is 35,300 lb as a standard shovel. Separated drum gears and clutch shells permit the use of alloy cast iron clutch shells. Clutch shells are bolted to the drum gears. Six conical hook rollers are standard on the LS-68. This crawler-base rig is fully convertible to all standard front end attachments with a minimum of conversion time, without major changes to the main machinery, clutches, brakes, gears, etc.

Link-Belt Speeder distributors are now offering complete literature and specifications on the LS-68. Bulletin No. 2541 on the new machine can be had by writing Link-Belt Speeder Corp., Cedar Rapids, Iowa.

New I-R Compressor

A packaged air compressor in the 75-100 hp range has just been introduced by Ingersoll-Rand Co.

The new machine, known as the PHE, is an opposed-cylinder, balanced design driven by a direct connected,

induction motor. It is a packaged, ready-to-run, heavy duty unit, arranged in single or multi-stages. The basic design is a two-stage unit for 80-125 psi but other cylinder arrangements are available for higher pressures or for pumping vacuums.

Requiring very little floor space, a simple foundation and a minimum of piping and connections, the PHE is suitable for factories, foundries, railroad shops, mines, powerhouses and large construction jobs.

For additional information on this new compressor write Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. or your nearest Ingersoll-Rand branch office and request a copy of Form 3155.

300-Amp. Rectifier-Type Welder

A new 300-amp, NEMA-rated, rectifier-type welder featuring quiet operation and low maintenance cost has been announced by the General Electric Company's Welding Department.

Now in production at the department's new plant at York, Pa., the welder offers full time arc force control for holding very short arcs with deep penetration, according to company engineers.

A current range of 20 to 375 amp. is provided. The new welder utilizes the moving primary coil design, obtaining current adjustments by separation of primary and secondary coils. Stepless current control and highly accurate amperage settings are made possible by this design. Windings are aluminum and silicone insulation is used on all coils.

Designated 6WR30B, the new welder is available for 220/440 or 550 volts operation.

Descriptive publication GEC-1267 describes the G-E development.

— *Announcements* —

R. H. Summer, manager, Denver District Office of the Explosives Department, **E. I. du Pont de Nemours & Co., Inc.** has retired after 38 years of service. **C. L. Barker**, formerly assistant manager, succeeds Summer and **F. W. Parrott** becomes assistant manager.

Ohio Brass Co. announces the appointment of **Paul E. Wright** to the position of field engineer, Mining Division.

Francis B. Speaker has been named manager of nonferrous metal mining industry sales development by **Hewitt-Robins Incorporated**, Stamford, Conn. Speaker joined Hewitt-Robins in 1945. From 1951 until 1953, he was Director of the Mining Division, Defense Materials Procurement Agency. Presently he is a consultant to the General Services Administration.

Wedge Wire Corp. has moved into its new modern plant in Wellington, Ohio. Their address is now Gas Street at Nickel Plate Railroad, Wellington, Ohio.

Dravo Corp., Machinery Division, Pittsburgh, Pa., announces the addition of iron ore sintering and pelletizing equipment to its line of industrial machinery. Under an exclusive licensing agreement with Lurgi Gesellschaft fur Chemie und Huttenwesen, M.B.H., Frankfurt, A. M., Germany, Dravo will manufacture and market complete iron ore sintering and pelletizing plants for the ore and steel industries in the United States.

International Harvester Co. and the **Diamond T Motor Car Co.** have announced an agreement whereby Diamond T will assemble some special models of motor trucks for International Harvester, and Harvester will manufacture for Diamond T certain components used in the assembly of Diamond T motor truck models.

Clarkson Mfg. Co., Nashville, Ill., has announced the resignation of **Clyde E. Clarkson** as vice-president and director of the company. Clarkson, co-founder of the company, plans to establish residence in Denver, Colo., and organize a sales company there.

The **Dorr Co.**, with headquarters in Stamford, Conn., and **Oliver United Filters, Inc.**, with headquarters in Oakland, Calif., have announced the execution of an agreement for the merger of the two companies. Special meetings of the stockholders of both companies to approve the agreement will be held in October and if approval is granted, the merger will become effective December 31, 1954.

The name of the merged company will be Dorr-Oliver, Inc., with headquarters in Stamford, Conn.

CATALOGS AND BULLETINS

COAL HANDLING EQUIPMENT. *Dravo Corp., Neville Island, Pittsburgh 25, Pa.* "Dravo Equipment for Handling Bulk Materials" describes various types of equipment and structures for handling coal, ore and other bulk materials. Such topics as mechanical, electrical and structural features of ore and coal bridges, man trolley unloaders, rope-operated towers, replacement trolleys, hydraulic buffers and rail clamps are discussed. Address requests to company at above address on business letterhead.

CONVEYORS, BUCKET ELEVATORS AND FEEDERS. *Bonded Scale and Machine Co., 2176 South Third St., Columbus 7, Ohio.* Catalog No. 44 describes the company's line of troughing idler conveyors, pulleys, idlers, takeups, flight conveyors, belt and chain type bucket elevators, feeders and a complete line of industrial conveyors, stackers, picking, inspection and assembly conveyors.

DRAGLINE BUCKET REPLACEMENT PARTS. *Electric Steel Foundry Co., 2141 N. W. 25th Ave., Portland 10, Ore.* Replacement parts for any make or model of dragline bucket are described in Bulletin No. 108-K. The 28-page catalog is indexed and tabbed for speedy reference to parts.

HARD SURFACING MANUAL. *Victor Equipment Co., Alloy Rod and Metal Div., 11440 S. Alameda St., Los Angeles 59, Calif.* Information as to type of alloy to use, preparation, welding and finishing procedures for hard surfacing equipment parts is shown. Information is based on "job-tested" usage of latest accepted alloys and methods.

IGAS JOINT SEALER. *Sika Chemical Corp., Passaic, N. J.* A waterstop which is installed *after concrete is placed* is described in a booklet which discusses a non-meltable mastic material for sealing joints subject to severe movement and pressure, between a variety of rigid structural materials such as concrete to concrete, concrete to steel, even concrete to glass. Igas is described as non-sagging to 180° F., non-brittle below —10° F., resistant to water, weather and chemicals, with an ability to resist temperatures as high as 500° F. without becoming fluid, polymerizing, or otherwise breaking down.

INSTRUMENT TRANSFORMER BUYER'S GUIDE. *General Electric Co., Schenectady 5, N. Y.* A 96-page publication, GEA-4626G contains ratings, ASA accuracy classifications and prices of all G-E indoor and outdoor potential and current transformers.

PINCH VALVES. *General Rubber Corp., Tenafly, N. J.* Describes a complete line of replacement pinch valve bodies. Ask for Bulletin No. 345.

SILENT CHAINS. *Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.* Detailed engineering data on the design and use of silent chains is included in Book No. 2425. One section outlines the procedure for selecting completely engineered drives. A conveniently indexed table of service factors, rating tables and chain length and center distance computations is included.

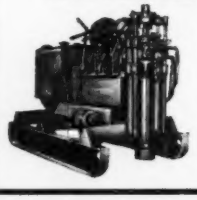
V-BELT. *B. F. Goodrich Industrial Products Div., Akron, Ohio.* BFG patented grommet belts in standard and high capacity constructions are featured. New horsepower rating tables permit the design or re-design of V-belt drives at reduced cost.

Index to Advertisers

	Page
Allis-Chalmers Mfg. Co. Tractor Division	1 and 6-7
American Brattice Cloth Corp.	70
ACF Industries	4
American Cyanamid Co. Explosives Department	17
Anaconda Wire & Cable Co.	2 and 43
Atlas Powder Co.	19
Bethlehem Steel Co.	20
Bowers Battery & Spark Plug Co.	81
Bucyrus-Erie Co.	16
Card Iron Works Co., Inc., C. S.	79
Chicago Pneumatic Tool Co.	18
Cleveland Rock Drill Division Westinghouse Air Brake Co.	14-15
Colorado Fuel & Iron Corp.	77
Crucible Steel Co. of America	8
Deister Concentrator Co., The	71
Denver Equipment Co.	58
Edison, Inc., Thomas A.	72
Engineers Syndicate, Ltd.	81
Euclid Division General Motors Corp.	Third Cover
Flexible Steel Lacing Co.	75
Greensburg Machine Co.	74
Hendrick Mfg. Co.	73
Hoffman Brothers Drilling Co.	75
Holmes & Brothers, Inc., Robert	12
Jeffrey Mfg. Co.	Second Cover and 10-11
Joy Mfg. Co.	44-45
Link-Belt Speeder Corp.	22
Loftus Corp., Peter F.	68
Lubriplate Division Fiske Brothers Refining Co.	70
Macwhyte Company	80
Mine Safety Appliances Co.	Fourth Cover
Mott Core Drilling Co.	86
National Carbon Co.	9
National Electric Coil Co.	57
New York Air Brake Co., The	13
Nordberg Mfg. Co.	23
Ohio Brass Co.	21
Pattin Mfg. Co.	74
Pennsylvania Drilling Co.	86
Precision Radiation Instruments, Inc.	76
Read, Davis	68
Roberts & Schaefer Co.	24
Roebling's Sons Co., John A.	47
Sheffield Steel Corp.	63
Stratoflex, Inc.	78
Timken Roller Bearing Co.	3
Union Wire Rope Corp.	46
United States Rubber Co.	48
Universal Vibrating Screen Co.	86
Van Nostrand Co., Inc., D.	82
Woomer & Associates, J. W.	68

CORE DRILLING
ANYWHERE
We look into the earth
PENNSYLVANIA DRILLING COMPANY
PITTSBURGH 20, PA.

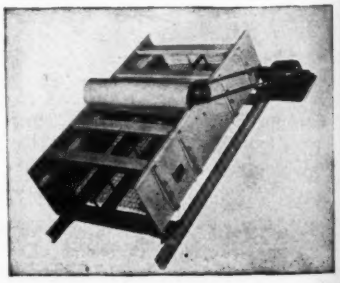
CORE DRILLING
CONTRACTORS
DIAMOND CORE DRILLING FOR COAL, CLAYS and ALL MINERALS
FOUNDATION TESTING
HIGH PRESSURE GROUTING FOR MINE SHAFTS, DAMS and BUILDINGS
LARGE DIA. HOLES FOR DRAINAGE



MOTT
CORE DRILLING CO.
Huntington, W. Va.

For fast, economical screening there is nothing finer than the dependable type "MR" 42" x 96" 2-deck model.

WRITE FOR BULLETIN No. 125 TODAY.



UNIVERSAL VIBRATING SCREEN CO.
RACINE, WIS.

Page
... 75
... 12
10-11
44-45
... 22
... 68
... 70
... 80
Cover
... 86
.... 9
.... 57
.... 13
.... 23
.... 21
.... 74
.... 86
.... 76
.... 68
.... 24
.... 47
.... 63
.... 78
.... 3
.... 46
.... 48
.... 86
.... 82
.... 68

SMALL QUARRIES AND MINES IMPROVE THEIR PROFIT PICTURE WITH "EUCS"

fewer drivers . . . lower fuel cost . . . reduced maintenance

When your competitors are using "Eucs" to haul stone, sand or gravel, you've really got a problem on your hands! You just can't afford to pass up the cost cutting advantages . . . the high production and low maintenance cost . . . that you get with "Eucs".

And your operation doesn't have to be a big tonnage producer for "Eucs" to pay off. For example, H & R Stone Co. of Indiana is just one of many small quarries, sand and gravel producers, and open pit mines that have cut their hauling costs with Model UD 10-ton Rear Dumps. This quarry replaced four conventional highway trucks with a single 10-ton "Euc" and reports savings of $6000 per year in maintenance cost alone. Because the "Euc" stays on the job with none of the lost time that was a costly headache previously, there have been important savings in labor cost, too.

Have your nearby Euclid Distributor provide a production and cost estimate for your operation . . . there's no obligation and the chances are mighty good that he can show the way to better profits through lower hauling costs.

10-ton off-highway "Euc"

Cable Yuklid - Code Bentley

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

He helped light the way to Safety

FOR MINERS EVERYWHERE

This month, the nation marks the 75th anniversary of Thomas A. Edison's invention of the first practical incandescent lamp. Giving added luster to this celebration is another of his great inventions . . . the first safe cap lamp for miners. Because his lamp eliminated the principal cause of mine fires and explosions—the open flame lamp—Edison called it his "most humanitarian invention."

M.S.A. has been world distributor of Edison Lamps since their introduction in 1915. Working with Edison Laboratories ever since, M.S.A. has continued to improve efficiency and construction. The cumulative result of this combined activity is the present Edison R-4—100 times brighter than the first Edison lamp. The R-4's contribution to underground safety and production is written in the records of its many users.

MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service . . . our job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service:
77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

SERVING SAFETY
40
YEARS
1914 ★ 1954

since
atories
cy and
ctivity
ne first
safety
users.